F-22A Beddown Environmental Assessment
Elmendorf Air Force Base, Alaska

June 2006

Report Documentation Page			*Form Approved* *OMB No. 0704-0188*
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.			
1. REPORT DATE **JUN 2006**	2. REPORT TYPE		3. DATES COVERED **00-00-2006 to 00-00-2006**
4. TITLE AND SUBTITLE **F-22A Beddown Environmental Assessment Elmendorf Air Force Base, Alaska**			5a. CONTRACT NUMBER
			5b. GRANT NUMBER
			5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)			5d. PROJECT NUMBER
			5e. TASK NUMBER
			5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **3 Civil Engineering Squadron,3 CES/CC,6326 Arctic Warrior Drive,Elmendorf AFB,AK,99506**			8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)			10. SPONSOR/MONITOR’S ACRONYM(S)
			11. SPONSOR/MONITOR’S REPORT NUMBER(S)
12. DISTRIBUTION/AVAILABILITY STATEMENT **Approved for public release; distribution unlimited**			
13. SUPPLEMENTARY NOTES			

14. ABSTRACT

This EA has been prepared in accordance with the National Environmental Policy Act (NEPA). The public and agency scoping process focused the analysis on the following environmental resources: airspace management and air traffic control, noise safety, air quality, physical resources, biological resources, cultural resources, land use, socioeconomics, and environmental justice. The Proposed Action is to beddown two F-22A squadrons using one of three facility construction options. Option A findings indicate that airspace management would not be affected by F-22A aircraft replacing one squadron of F-15C and the F-15E squadron scheduled to be relocated by the Base Realignment and Closure Act of 2005. Northern portions of Elmendorf AFB, portions of the Knik Arm and Port MacKenzie area, and the Port of Anchorage would be within the 65 dB noise contour. These changes are not projected to significantly impact human or natural resources. Construction noise and air emissions would be localized and temporary. Construction is not expected to impact wetlands or special-status species, but would remove regrown native vegetation. Any hazardous materials associated with aircraft coatings will be handled in the new maintenance facility and controlled to protect air and water resources. Three unevaluated, but potentially eligible National Register of Historic Places (NRHP) structures would require evaluation and possible State Historic Preservation Officer (SHPO) consultation. A fourth structure has been determined to be eligible for the NRHP. Short-term traffic congestion may occur during $402 million of construction projects. A net reduction of 669 base positions (7.9 percent) and 223 secondary employment jobs is anticipated partially offset by a gain of 1,904 jobs during facility construction. There would be no disproportionate effects upon disadvantaged populations or children. Option B would have essentially the same effects as Option A, except with $323 million construction at two previously disturbed locations. Four unevaluated, but potentially eligible NRHP structures would require evaluation and possible SHPO consultation. A fifth structure has been determined to be eligible for the NRHP. Construction would result in a gain of 1,526 temporary construction jobs. Option B is the Air Force?s preferred alternative and was noted as preferred by a commentor on the Draft EA. Option C would have essentially the same effects as Option A, except with $325 million construction in three separate locations. Construction includes facilities within the Flightline Historic District. The same four structures as Option B plus renovation to two Flightline Historic District hangars and a third NRHP-eligible hangar could require SHPO consultation. Construction would result in a gain of 1,536

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT **unclassified**	b. ABSTRACT **unclassified**	c. THIS PAGE **unclassified**	**Same as Report (SAR)**	**331**	

F-22A Beddown Environmental Assessment
Elmendorf Air Force Base, Alaska

Our goal is to give you a reader-friendly document that provides an in-depth, accurate analysis of potential environmental consequences. The organization of this Environmental Assessment, or EA, is shown below:

How to Use This Document

This Environmental Assessment (EA) is prepared to help the reader understand the environmental consequences of the Proposed Action to beddown two squadrons of F-22A aircraft at Elmendorf AFB. Please review Chapter 1.0 and 2.0 to learn the purpose and details of the proposed beddown.

Chapter 3.0 explains the environmental consequences of the three optional construction programs to accomplish the beddown at Elmendorf AFB. The No Action Alternative is also addressed. Option B is the Air Force's preferred alternative.

Chapter 4.0 explains the environmental consequences of F-22A training within Alaskan training special use airspace and compares the proposed F-22A training with existing training by F-15C and F-15E aircraft.

Public and Alaska Native comments on the Draft EA are incorporated into this EA.

The box to the left summarizes the EA contents.

Acronyms and Abbreviations can be found on the inside back cover.

Cover Sheet

ENVIRONMENTAL ASSESSMENT (EA) FOR THE F-22A BEDDOWN AT ELMENDORF AIR FORCE BASE (AFB)

a. *Responsible Agency:* United States Air Force (Air Force)

b. *Proposals and Actions:* This EA analyzes the potential environmental consequences of a proposal to establish the Second F-22A Operational Wing at Elmendorf AFB. Elmendorf AFB is the only base originally evaluated for the initial F-22A beddown with a location on the Pacific Rim and the capacity at this time to support the beddown. The proposal would position an F-22A Operational Wing for rapid worldwide deployment in response to national directives. The F-22A is a 21st Century fighter designed to replace and supplement F-15C and F-15E aircraft which can be targeted by enemy air defenses at increasingly greater distances. The F-22A has the stealth, speed, and maneuverability to overcome adversaries and ensure air dominance over any battlefield. Elmendorf AFB provides infrastructure and facilities to support two operational squadrons of F-22A aircraft, has the capability to accommodate new facilities needed for the F-22A weapon system, and provides access to training airspace. The Proposed Action is to beddown two F-22A operational squadrons; fly sorties for training and deployment; construct facilities and infrastructure; and change personnel. F-22A training would use existing Alaskan Military Operations Areas (MOAs), Air Traffic Control Assigned Airspace (ATCAA), and ranges. Defensive flares and chaff would be employed in airspace authorized for their use and munitions would be deployed on approved ranges. Three construction options are under consideration. Option A constructs all facilities in Fighter Town East (FTE) on 50 acres of previously disturbed land. Option B constructs some facilities in FTE and some facilities north of Runway 06/24 on a total of 40 acres of previously disturbed land. Option C distributes the wing in three locations with facilities in FTE, north of Runway 06/24, and in remodeled facilities west of Runway 34/16 on a total of 30 acres of previously disturbed land. Option C locates some facilities inconsistently with the Base General Plan and some F-22As would be parked in the runway clear zone. The No Action Alternative would not beddown F-22As at Elmendorf AFB at this time.

c. *For Additional Information:* 3rd Wing Public Affairs, Environmental Community Affairs Coordinator, 10480 22nd St., Ste. 118, Elmendorf AFB AK 99506. Telephone inquiries may be made to 907-552-5756.

d. *Designation:* Environmental Assessment

e. *Abstract:* This EA has been prepared in accordance with the National Environmental Policy Act (NEPA). The public and agency scoping process focused the analysis on the following environmental resources: airspace management and air traffic control, noise, safety, air quality, physical resources, biological resources, cultural resources, land use, socioeconomics, and environmental justice.

The Proposed Action is to beddown two F-22A squadrons using one of three facility construction options.

Option A findings indicate that airspace management would not be affected by F-22A aircraft replacing one squadron of F-15C and the F-15E squadron scheduled to be relocated by the Base Realignment and Closure Act of 2005. Northern portions of Elmendorf AFB, portions of the Knik Arm and Port MacKenzie area, and the Port of Anchorage would be within the 65 dB noise contour. These changes are not projected to significantly impact human or natural resources. Construction noise and air emissions would be localized and temporary. Construction is not expected to impact wetlands or special-status species, but would remove regrown native vegetation. Any hazardous materials associated with aircraft coatings will be handled in the new maintenance facility and controlled to protect air and water resources. Three unevaluated, but potentially eligible National Register of Historic Places (NRHP) structures would require evaluation and possible State Historic Preservation Officer (SHPO) consultation. A fourth structure has been determined to be eligible for the NRHP. Short-term traffic congestion may occur during $402 million of construction projects. A net reduction of 669 base positions (7.9 percent) and 223 secondary employment jobs is anticipated, partially offset by a gain of 1,904 jobs during facility construction. There would be no disproportionate effects upon disadvantaged populations or children.

Option B would have essentially the same effects as Option A, except with $323 million construction at two previously disturbed locations. Four unevaluated, but potentially eligible NRHP structures would require evaluation and possible SHPO consultation. A fifth structure has been determined to be eligible for the NRHP. Construction would result in a gain of 1,526 temporary construction jobs. Option B is the Air Force's preferred alternative and was noted as preferred by a commentor on the Draft EA.

Option C would have essentially the same effects as Option A, except with $325 million construction in three separate locations. Construction includes facilities within the Flightline Historic District. The same four structures as Option B plus renovation to two Flightline Historic District hangars and a third NRHP-eligible hangar could require SHPO consultation. Construction would result in a gain of 1,536 temporary construction jobs.

No Action could affect the BRAC schedule for relocating one F-15C and one F-15E squadron from Elmendorf AFB.

The Proposed Action includes F-22A training in existing Alaskan Special Use Airspace (SUA). F-22As have advanced tracking computers and spend more time at higher altitudes than F-15Cs or F-15Es. This should minimally improve airspace management and safety within the airspace. F-22A increased supersonic capabilities result in 1 to 4 additional sonic booms per month in approved training airspaces except the Stony MOAs, where there would be an increase from an existing 15 to an estimated 28 sonic booms per month. Based on meetings with Alaska Natives in villages under the Stony MOAs during the Initial F-22 Operational Wing Beddown EIS and on comments received during scoping for this EA, this number of sonic booms is not expected to affect special status species, game species, or Alaska Native subsistence hunting or fishing. Alaska Natives or others who reside or spend extensive time under the Stony MOAs could have increased disturbance. F-22A chaff and flare use and munitions training on approved ranges would not be substantially different from existing conditions.

FINDING OF NO SIGNIFICANT IMPACT

NAME OF PROPOSED ACTION. F-22A Beddown at Elmendorf Air Force Base (AFB), Alaska.

DESCRIPTION OF THE PROPOSED ACTION AND NO ACTION ALTERNATIVES. The United States Air Force (Air Force) proposes to beddown two F-22A operational squadrons at Elmendorf AFB. The F-22A is a 21st century fighter designed to replace and supplement F-15C and F-15E aircraft which can be targeted by enemy air defenses at increasingly greater distances. The Proposed Action would beddown two operational squadrons (18 Primary Assigned Inventory [PAI] aircraft each) over a period of approximately 5 years and conduct flying sorties at the base and in existing Alaskan airspace. Personnel changes associated with the beddown of F-22A aircraft in combination with the Base Realignment and Closure Act (BRAC) reassignment of one F-15C squadron and the F-15E squadron would result in a net loss of 669 positions (36 officer and 759 enlisted positions at the base and an increase of 126 civilian positions). F-22A training flights would take place on existing Alaskan Military Operations Areas (MOAs), Air Traffic Control Assigned Airspace (ATCAAs), and ranges. During training, F-22As would employ defensive countermeasures such as chaff and flares in airspace authorized for their use and deploy munitions on approved ranges.

The Proposed Action could be accomplished through one of three construction options. Option A would construct facilities and infrastructure in an area designated as Fighter Town East (FTE) in the southeast portion of the base for a total cost of $402 million. Option B would construct some new facilities at FTE and modify some existing facilities across Runway 06/24 at an estimated cost of $323 million. Option C would locate wing facilities in FTE and modify existing facilities across Runway 06/24 and across Runway 16/34 at an estimated cost of $325 million. Under Option C, some F-22A aircraft would be parked in the runway clear zone (CZ).

The No Action Alternative would not locate an F-22A Operational Wing at Elmendorf AFB at this time. Based on the national mission of Elmendorf, No Action could affect the schedule for implementing BRAC 2005 actions.

SUMMARY OF ENVIRONMENTAL CONSEQUENCES. The Environmental Assessment (EA) addresses the potential environmental consequences from implementing the Proposed Action through Option A, B, or C and includes the No Action Alternative. Through scoping and other agency and public inputs, the following resource areas were identified for assessment of potential direct or indirect environmental consequences: airspace management and air traffic control (including airport traffic), noise, safety, air quality, physical resources, biological resources, cultural resources, land use, socioeconomics, and environmental justice. Potential cumulative effects for each relevant resource are also presented.

The EA demonstrates that the proposed F-22A beddown would not result in significant environmental impacts to any environmental resource area. Potential environmental consequences may be summarized as follows. Under Option A, airspace management would not be impacted by the change in aircraft types. Portions of the Knik Arm, Port MacKenzie area, and the Port of Anchorage would experience noise levels of 65 dB or greater, but this change is not projected to significantly impact any human or natural resources, including Knik Arm beluga whales which occur in adjacent waters. The 65 dB noise contours would not extend off base over residential areas. Construction noise and air emissions would be localized and temporary. Option A constructs all facilities on a total of 50 acres of previously disturbed land at an estimated cost of $402 million. Construction would remove 30 acres of second growth forests but is not expected to impact wetlands or special-status species. Any hazardous materials associated with aircraft coatings will be handled in the new maintenance facility and controlled to protect air and water resources. Two structures scheduled for demolition and one for renovation would be evaluated for National Register of Historic Places (NRHP) eligibility. A fourth structure slated for renovation has been determined to be eligible for the NRHP. As defined in the Integrated Cultural Resources Management Plan, State Historic Preservation Officer (SHPO) consultation would be performed on eligible and potentially eligible structures scheduled for demolition or exterior renovation. Short-term traffic congestion may occur during construction. A net reduction of 669 base positions (7.9 percent of base employment) is anticipated. A long-term reduction in off-base secondary employment by an estimated 223 positions would be somewhat offset

by a short-term gain of 1,904 temporary construction jobs. Disadvantaged populations and children would not be disproportionately affected by the proposed beddown.

Option B would have essentially the same effects as Option A, except $323 million construction would occur on a total of 40 acres of previously disturbed land with 20 acres of second growth forests. Two structures scheduled for demolition and two for renovation would be evaluated for potential NRHP eligibility. A fifth structure to be renovated has already been determined eligible for the NRHP. Option B is the Air Force's preferred option and was noted as preferred by a commentor on the Draft EA. SHPO consultation would be performed as described for Option A. Construction would result in a gain of 1,526 temporary construction jobs. Option C would have essentially the same effects as Option A, except with $325 million construction in three separate locations on a total of 30 acres of previously disturbed land with 10 acres of second growth forest. In addition to the structures noted in Option B, Option C renovates two hangars in the Flightline Historic District. Any exterior renovation to these structures would require SHPO consultation. Construction would result in a gain of 1,536 temporary construction jobs.

Potential consequences associated with the proposed F-22A flight activities in existing Alaskan Special Use Airspace (SUA) may be summarized as follows. Under the Proposed Action, the F-22As will be replacing some existing F-15Cs and F-15Es. F-22As have advanced tracking computers and spend more time at higher altitudes than F-15Cs or F-15Es. This should minimally improve airspace management and safety within the airspace. F-22A increased supersonic capabilities result in 1 to 4 additional sonic booms per month in approved training airspaces except the Stony MOAs, where there would be an increase from the existing 15 to an estimated 28 sonic booms per month. Based on meetings with Alaska Natives in villages under the Stony MOAs during the Initial F-22 Operational Wing Beddown Environmental Impact Statement, and on comments received during scoping for this EA, this number of sonic booms is not expected to affect special status species, game species, or Alaska Native subsistence hunting or fishing. Alaska Natives or others who reside or spend extensive time under the airspace could have increased disturbance. Air quality, land use, recreation, and cultural resources should not be affected by the change in aircraft type. F-22A chaff and flare use and munitions training on approved ranges would not be substantially different from existing conditions.

Based on the findings of the EA Option B conducted in accordance with the requirements of the National Environmental Policy Act, the Council on Environmental Quality regulations, and implementing regulations set forth in 32 CFR 989 (Environmental Impact Analysis Process), as amended, implementation of the Proposed Action would not result in significant impacts to the quality of the human or natural environment. As such, a finding of no significant impact (FONSI) is made and preparation of an Environmental Impact Statement is not warranted. The FONSI incorporates by reference the April 06 EA, as amended by responses to public comments received during the 30-day public comment period and added as Table 2.4-3. For ease of reading, the responses to public comments, the April 06 EA and Table 2.4.-3 will be integrated into a single EA, dated June 2006, which will be on file at:

3rd Wing Public Affairs
Environmental Community Affairs Coordinator
10480 22nd Street, Suite 118
Elmendorf AFB AK 99506

HERBERT J. CARLISLE
Brigadier General, USAF
3rd Wing Commander
Elmendorf Air Force Base, Alaska

25 May 2006
Date

F-22A BEDDOWN ENVIRONMENTAL ASSESSMENT

Elmendorf Air Force Base, Alaska

June 2006

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TABLES

FIGURES

EXECUTIVE SUMMARY

The United States (U.S.) Congress has identified and approved the next-generation F-22A air dominance fighter to replace and supplement the increasingly vulnerable F-15C and F-15E aircraft fleets. The Environmental Assessment (EA) analyzes the United States Air Force (Air Force) proposal to locate or beddown the Second F-22A Operational Wing at Elmendorf Air Force Base (AFB).

The proposal is to beddown two F-22A operational squadrons (each consisting of 18 Primary Aircraft Inventory [PAI] and 2 Backup Aircraft Inventory [BAI]) over a period of approximately five years; conduct flying sorties at the base for training and deployment after beddown; construct or remodel facilities and infrastructure to support the F-22A Operational Wing; and implement personnel changes to conform to the F-22A Wing requirements. The two F-22A squadrons would take the place of one squadron of F-15C and one squadron of F-15E aircraft designated to leave Elmendorf AFB. F-22A training flights would take place on Alaskan Military Operations Areas (MOAs), Air Traffic Control Assigned Airspace (ATCAA), Military Training Routes (MTRs), and ranges where F-15C and F-15E aircraft currently train. During training, F-22As would employ defensive countermeasures such as chaff and flares in airspace authorized for their use where F-15C and F-15E aircraft currently do. Munitions would continue to be deployed on approved ranges.

> Community outreach and scoping handouts and Interagency and Intergovernmental Coordination for Environmental Planning (IICEP) letters provided by the Air Force in late 2005 and early 2006 included information on 48 PAI as the Proposed Action. Since that time, the number of aircraft has been modified to 36 PAI.

This EA has been prepared in accordance with the National Environmental Policy Act (NEPA) and its implementing regulations and is issued for a 30-day public and agency review and comment period. Comments on the Draft EA are incorporated into this EA. These comments, in addition to the EA analyses, will be considered in decision-making regarding the F-22A beddown proposal.

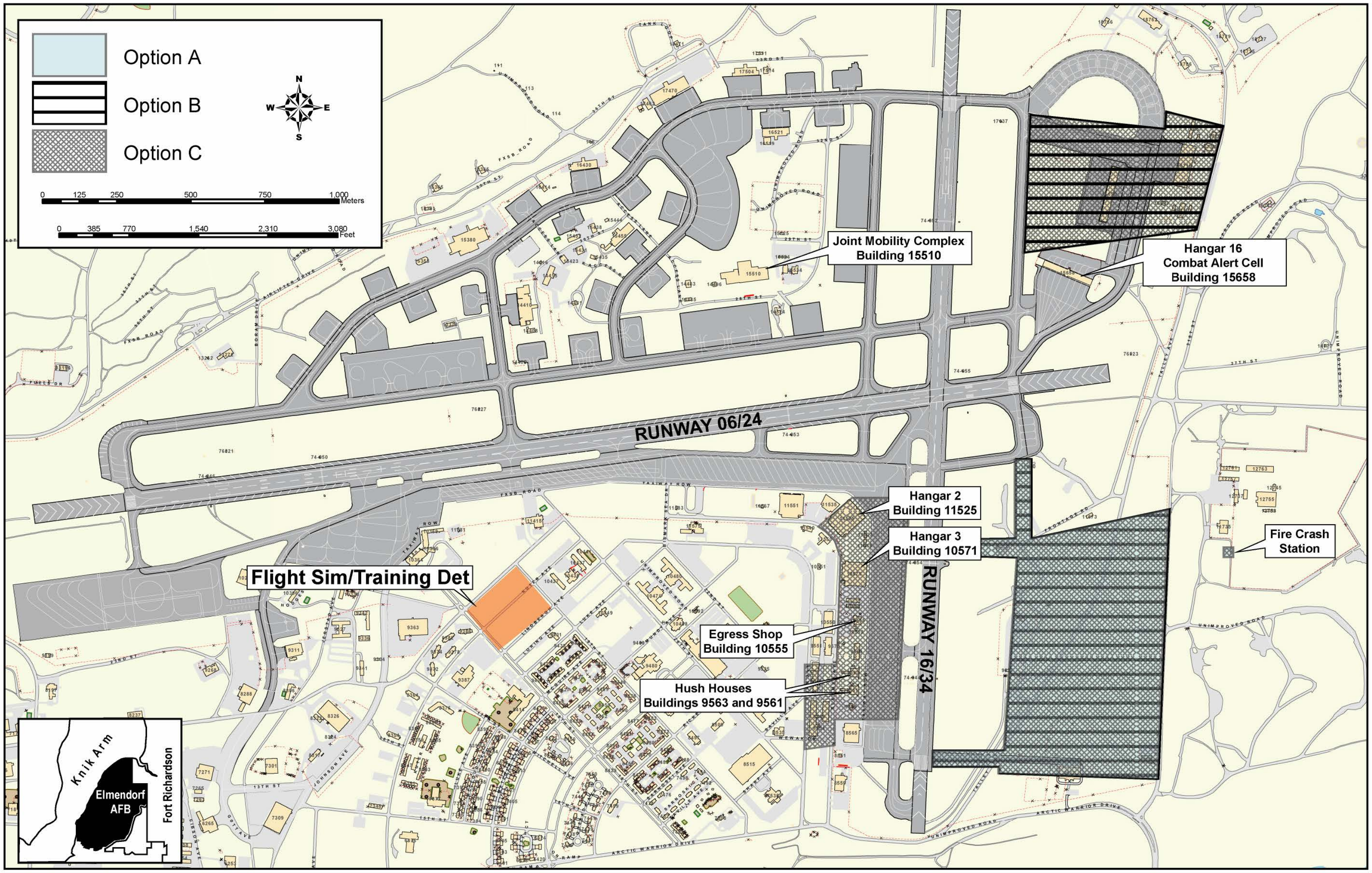
PURPOSE AND NEED

The F-22A is a 21st century fighter designed to replace and supplement F-15C and F-15E aircraft which can be targeted by enemy air defenses at increasingly greater distances. The F-22A has the stealth, speed, and maneuverability to overcome adversaries and ensure air dominance over any battlefield. The purpose of the Elmendorf AFB F-22A Operational Wing is to locate these advanced assets in the westernmost U.S. to enable the Air Force to achieve rapid worldwide deployment in response to directives of the President and Secretary of Defense. The Operational Wing installation must meet the original selection criteria evaluated in an Environmental Impact Statement (EIS) for the location of the F-22 Initial Operational Wing; meet national needs for location with access to the Pacific Rim; and have the capacity at this time to beddown the Second F-22A Operational Wing.

PROPOSED ACTION AND NO ACTION ALTERNATIVES

Elmendorf AFB is the only remaining base of the six originally evaluated for an F-22A Operational Wing that has the capability to beddown an F-22A Operational Wing at this time. Elmendorf AFB is geographically positioned to support the use of operational F-22A aircraft in meeting national defense objectives.

Figure ES-1. Optional Development Areas



The Proposed Action is to beddown an F-22A Operational Wing at Elmendorf AFB through one of three facility construction options.

- Option A includes the most new construction, with all facilities built in Fighter Town East (FTE) east of Runway 16/34 (see Figure ES-1). Option A construction is estimated to cost $402 million.
- Option B would modify existing facilities northeast of Runway 06/24 and construct some new facilities in the FTE area and on the southeast portion of the base (see Figure ES-1). Option B is estimated to cost $323 million. Implementing the Proposed Action using Option B is the Air Force's preferred alternative.
- Option C would modify existing facilities and split wing operations in three locations: the FTE area, northeast of Runway 06/24, and west of Runway 16/34. Option C is estimated to cost $325 million. Under Option C, some F-22As would be parked in the runway clear zone (CZ).

The No Action Alternative would not locate an F-22A Operational Wing at Elmendorf AFB at this time. No Action would involve no construction for new fighter facilities, but could affect successful execution of Elmendorf AFB missions and the Base Realignment and Closure (BRAC) schedule for relocating one F-15C squadron and one F-15E squadron from Elmendorf AFB.

ENVIRONMENTAL CONSEQUENCES

The public and agency scoping process focused the analysis on the following environmental resources: airspace management and air traffic control (including airport traffic), noise, safety, air quality, physical resources, biological resources, cultural resources, land use, socioeconomics, and environmental justice.

Please refer to Figure 1.1-1 for Elmendorf AFB and Figure 1.1-2 for Alaskan airspace discussions.

Airspace Management and Air Traffic Control

Base. F-22A aircraft would use the base runways and fly in the base environs similarly to the way the comparably sized F-15C and F-15E aircraft do today. The Proposed Action would reduce fighter sorties by approximately 10 per day. Anchorage Alaska Terminal Area (AATA) management of airspace would not be affected by this change.

Airspace. F-22A aircraft would use the same airspace currently used for F-15C and F-15E training. The F-22A aircraft typically fly at higher altitudes and use MTRs less than the F-15Es. This could minimally reduce the number of low level military aircraft at altitudes where the majority of general aviation activity occurs. There would be no anticipated impacts to airspace management.

Noise

Base. A segment of the port west of the base, and a portion of the Knik Arm would come under the 65 decibel (dB) contour. On base there would be increased noise in the northern portion of Elmendorf AFB and reduced noise in the western portion of Fort Richardson when compared with existing conditions. Off base noise would not be projected to significantly impact humans in the affected areas. Noise associated with construction would be localized, temporary, and have no long-term effect.

Airspace. Noise in military airspace is quantified by metrics called the Day-Night Average Sound Level (L_{dn}) and the Onset-Rate Adjusted Monthly Day-Night Average Sound Level (L_{dnmr}). Noise models account for the annoyance associated with the "surprise" effect of noise from high-speed military aircraft flying at low altitude or from sonic booms. No discernible difference in subsonic noise is projected in MOAs used for training. An increase in sonic booms, from the existing 15 to a projected 28 per month, would occur in the Stony MOAs. Other MOAs approved for supersonic training would have 1 to 4 additional sonic booms per month depending on the MOA. Currently there are 1 to 19 sonic booms per month in these MOAs. Noise levels would increase by less than 1 to 3 CDNL (C-weighted Day-Night Average Sound Level) in the Yukon, Stony, and Fox MOAs and by a noticeable 11.5 CDNL (from 33.6 to 45.1) under the Naknek MOA. The projected increase in sonic booms would not pose a health or other risk, but could increase annoyance.

Safety

Base. There will be no change in off base safety conditions, Bird-Aircraft Strike Hazard (BASH), munitions, or personnel safety. Elmendorf AFB aircraft ground safety would essentially remain the same with an F-22A beddown. Construction Options A and B lower the ground safety risk in that they remove fighter aircraft from parking in a runway CZ. Under Option C, some F-22As would park where F-15Cs currently park in the Runway 16/34 CZ.

Explosive safety includes the management and use of ordnance or munitions associated with airbase operations and training activities. The amount of munitions associated with the two F-22A squadrons is lower than the existing F-15E squadron. The number of chaff bundles and flares would be unchanged. Elmendorf AFB has the personnel and facilities to handle the munitions, chaff, and flares.

Airspace. There would be no substantive change in, or impacts to, flight, ground, or other safety aspects. Some reduced low-level flight by F-22A, as compared with F-15E, could minimally reduce military aircraft presence at general aviation altitudes. Improved situational awareness with F-22A systems facilitates see-and-avoid procedures.

F-15C and F-15E training aircraft currently use chaff and flares where approved in training airspace. After deployment of chaff or a flare, one to three 1-inch by 1-inch to 2-inch by 2-inch sized plastic or nylon pieces and one to three 2-inch by 4-inch mylar or 1-inch by 1-inch to 4-inch by 13-inch aluminum-coated mylar wrappings would fall to the ground. There is projected to be an increase in mylar pieces as a result of the chaff used by F-22A aircraft as compared with current F-15C and F-15E chaff. These plastic, nylon, or mylar pieces would not affect safety for human or biological resources under the airspace. There would be an overall reduction in use of training munitions at approved ranges. The F-22A stealth fighter does not have a fuel dump valve that could provide a radar signature and thus does not have the ability to dump fuel.

Air Quality

Base. The Anchorage area is in air quality attainment for all criteria pollutants except for the community of Eagle River, which is located 10 miles northeast of Elmendorf AFB and is designated as nonattainment for particulate matter less than or equal to 10 micrometers in diameter (PM_{10}). A portion of Anchorage achieved attainment for carbon monoxide (CO) in 2002, and is currently operating under a maintenance plan to assure continued attainment with the standard. Elmendorf AFB is located adjacent to the northern boundary of this CO maintenance area. Elmendorf AFB is in attainment for all criteria pollutants. The anticipated

emissions resulting from each option of the Proposed Action have been analyzed and it has been determined that the emissions will not cause or contribute to a new National Ambient Air Quality Standards (NAAQS) violation. Furthermore, a conformity determination is not required as the emissions for all pollutants is below the *de minimis* threshold established by the U.S. Environmental Protection Agency (USEPA) in 40 Code of Federal Regulations (CFR) 93.153. Construction emissions would produce localized, short-term elevated air pollutant concentrations that would not significantly affect local air quality or visibility. No conformity determination is required. Aircraft engine emissions are projected to be minimally higher than at present, but improved efficiency and reduced on-site maintenance should result in no change in air quality within the Anchorage area.

Airspace. Areas under the training airspace are within air quality attainment. Of the primary MOAs, only operations within the Susitna MOA overlie a Prevention of Significant Deterioration (PSD) Class I area: a portion of the Denali National Park and Preserve, where visibility must be protected and preserved. Class I areas are areas where any appreciable deterioration of air quality is considered significant. Compared to existing fighter aircraft, F-22As spend more time at higher altitudes where these emissions would be dispersed and would not measurably affect air quality or visibility in any Class 1 area.

Physical Resources

Base. Scoping comments expressed concern regarding potential consequences from erosion, sedimentation, storm water runoff, and toxic wastes. Construction of the F-22A facilities to support Option A would disturb approximately 50 acres in an area that was previously disturbed. Option B would disturb approximately 40 acres in two areas previously disturbed and Option C would disturb 30 acres in three areas previously disturbed. A remedial investigation/feasibility study for ERP site SS-22 could affect the location of the proposed Fire Crash Station. A construction National Pollutant Discharge Elimination System (NPDES) storm water permit and site-specific Storm Water Pollution Prevention Plan (SWPPP) would be required to describe the best management practices (BMPs) to eliminate or reduce sediment and non-storm water discharges. Impacts from erosion and off-site sedimentation would be negligible.

Under any option, new hazardous materials associated with aircraft coatings will be handled within a new maintenance facility. Hazardous materials and construction debris generated by the proposed project would be handled, stored, and disposed of in accordance with federal state and local regulations and laws. No significant effects are anticipated on earth or water resources, hazardous materials, hazardous wastes, or the Environmental Restoration Program (ERP).

Airspace. The F-22A beddown would not substantially change airspace use or training above physical resources. The only potential variation in physical effects to the airspace is the mylar wrapping from the F-22A chaff. Chaff consists of fine segments (thinner than a human hair) of aluminum-coated silica cut to lengths of 1/2 to 2 or more inches to reflect radar signals from threats to aircraft. For the F-22A, each bundle of chaff has three 2-inch by 4-inch mylar pieces. Chaff rapidly breaks up to become indistinguishable from native soils and would not produce a significant effect upon water or soils under the airspace. Plastic or mylar pieces that fall to the ground as a result of chaff or flare deployment would not be in concentrations that could affect soils or water resources. The number of defensive flares is essentially unchanged from current flare usage. Flare use altitude restrictions would remain in effect.

Biological Resources

Base. Scoping concerns for biological resources include habitat loss due to construction of new facilities, potential consequences to endangered and threatened species, noise associated with construction, and noise associated with F-22A operation and maintenance. Concerns for species near Elmendorf AFB include noise and potential run-off to water resources from construction or operation.

Under the Proposed Action, each beddown option would affect varying amounts of wildlife habitat in the southeast portion of the base. The FTE construction site includes removing a stand of 50 to 60 year old second growth trees which provides habitat for migratory songbirds and mammals. Five special-status bird species may occur at Elmendorf AFB, but only the olive-sided flycatcher and blackpoll warbler occur in the affected area. Clearing this marginal habitat during breeding season could disrupt some nesting birds.

Fugitive dust and soil erosion would be controlled via BMPs, or as in the case of hazardous materials associated with F-22A stealth coatings, incapsulation within newly constructed buildings to protect water resources. Noise contours associated with the proposed operation of the F-22As extend into the Knik Arm of Cook Inlet, where beluga whales occur. Reports indicate that beluga responses to aircraft included no response and diving. Based on the literature review of noise effects on marine mammals, noise associated with F-22A operations would not be expected to adversely affect beluga whales.

Airspace. Subsonic noise would essentially be the same as under current conditions. There would be no change in effects to wildlife. Increases in sonic booms under some airspace units may startle some animals. However, wildlife in the affected MOAs have previously experienced sonic booms and are likely habituated. Chaff and flare use would not be expected to adversely affect biological resources. The mylar pieces from F-22A chaff are not substantively different from the aluminum-coated mylar wrapping currently associated with flare use.

Cultural Resources

Base. The Proposed Action could affect on-base properties. Under Option A, three possible historic structures on Elmendorf AFB would be demolished or renovated: the Sentry Gate House (Building 9637) and Ammunition Storage Igloo (Building 10641) were both constructed in 1962 and the Egress Shop (Building 10555) was constructed in 1963. Under Option B, one additional possible historic structure would be renovated, Hangar 15 (Building 16716, constructed in 1956). Option C demolishes or renovates the same structures plus renovates Hangars 2 and 3, constructed in 1945 and located within the Flightline Historic District. Any structure proposed for demolition or exterior renovation would need to be evaluated for National Register of Historic Places (NRHP) eligibility prior to the construction or exterior renovation. If any structure is found to be potentially eligible, consultation with the State Historic Preservation Officer (SHPO) would be required prior to demolition or renovation.

The Air Force has consulted with the Alaska SHPO, following the guidelines stipulated in the Elmendorf AFB Integrated Cultural Resources Management Plan and the Draft Programmatic Agreement. While there are no recorded archaeological resources in the areas of the proposed development, and the areas have been previously disturbed during Elmendorf AFB's history, subsurface archaeological resources could exist in construction areas.

Airspace. There would be no impacts to historic properties under the airspace. The increase in sonic booms have the potential to disturb some Alaska Native users of land, but would not be expected to affect subsistence hunting.

Land Use

Base. The Proposed Action Options A or B would be consistent with the Base General Plan. Option C varies from the Base General Plan's Focus Area concept, but is consistent with the functional grouping of land uses. Under any option, some increases in noise levels are anticipated over land on the north portion of the base and some decrease in noise would occur over the west portion of Fort Richardson. Noise levels outside the 65 dB contour are not considered significant by the Federal Aviation Administration (FAA). The 65 dB contour would extend over a portion of the Port of Anchorage, Port MacKenzie, and Knik Arm. Noise levels would be consistent with land uses in those areas.

Under any option, there would be no changes to the safety zones. A decrease in on-base employment is expected and is likely to reduce vehicle trips in the long term. Increased commuter traffic during construction (2007 to 2010) would contribute to increased congestion at gates and in the processing of access passes.

Airspace. Increased sonic booms would occur in some recreational, hunting, or fishing areas. Individuals who live under or spend extensive time subsistence hunting and fishing, especially under the Stony MOAs, could discern an increase from the existing 15 to a projected 28 booms per month toward the center of the airspace. The increased frequency of sonic booms would not be expected to affect land use or land use patterns, ownership, or management, but the increase has the potential to cause additional disturbance to residents and long-term users of the lands under the affected airspace.

Socioeconomics

Base. Under Option A, potential direct impacts are estimated to include 1,649 construction jobs over the construction period and $89 million in direct earnings. The total socioeconomic impact of the proposed $402 million construction projects amount to an estimated regional economic stimulation of $497 million in total economic activity and generate 4,030 total jobs and total earnings of $156 million.

Under Option B, potential direct impacts are estimated to include 1,526 construction jobs over the construction period and $82 million in direct earnings. The total socioeconomic impact of the proposed $323 million construction projects amount to an estimated regional economic stimulation of $473 million in total economic activity and generate 3,230 total jobs and total earnings of $125 million.

Under Option C, potential direct impacts are estimated to include 1,536 construction jobs over the construction period and $83 million in direct earnings. The total socioeconomic impact of the proposed $325 million construction projects amount to an estimated regional economic stimulation of $476 million in total economic activity and generate 3,250 total jobs and total earnings of $126 million.

Under any option, 10 percent of the needed workforce may temporarily relocate and take up residency in the region, resulting in a 0.1 percent population increase, potentially affecting the demand for housing or community services, such as schools. These potential effects would be

temporary for the duration of the construction period. No permanent or long-lasting socioeconomic impacts are associated with the beddown construction options.

Under any construction option, total Elmendorf AFB personnel would be reduced by a net of 669 positions, comprised of a reduction in 36 officers and 759 enlisted personnel, partially offset by an addition of 126 civilian positions. It is estimated that 70 percent of departing military personnel would have family members. Based on the average family size of active duty personnel at Elmendorf AFB, an estimated 703 dependents would depart, for a total anticipated population decline of 1,372 persons. A decrease of this size represents 7.4 percent of the Elmendorf AFB base-related population and 0.5 percent of the Anchorage population. This would represent less than 0.7 percent of housing in the Municipality of Anchorage. The estimated reduction in payroll of $40.4 million (associated with the 669 reduced base positions) would reduce secondary employment within the community by an estimated 223 positions. In the dynamic Anchorage community, this change in employment or population is not likely to be noticed.

Airspace. There would be no discernible effects on social or economic conditions under the airspace. The projected increase in sonic booms, particularly under the Stony MOAs, may be discernible to individuals participating in subsistence or recreational hunting or fishing. This would not be expected to significantly affect activities under the airspace or local economies that rely on subsistence resources. For any damage claims associated with sonic booms, the Air Force has established procedures that begin with contacting the Elmendorf AFB Public Affairs Office.

Environmental Justice

Base. Federal agencies are required by law to address potential impacts of their actions on environmental and human health conditions in minority and low-income communities. Furthermore, they must identify and assess environmental health and safety risks that may disproportionately affect children. There would be no human health or safety consequences to minority or low-income communities and no disproportionate health and safety risks to children.

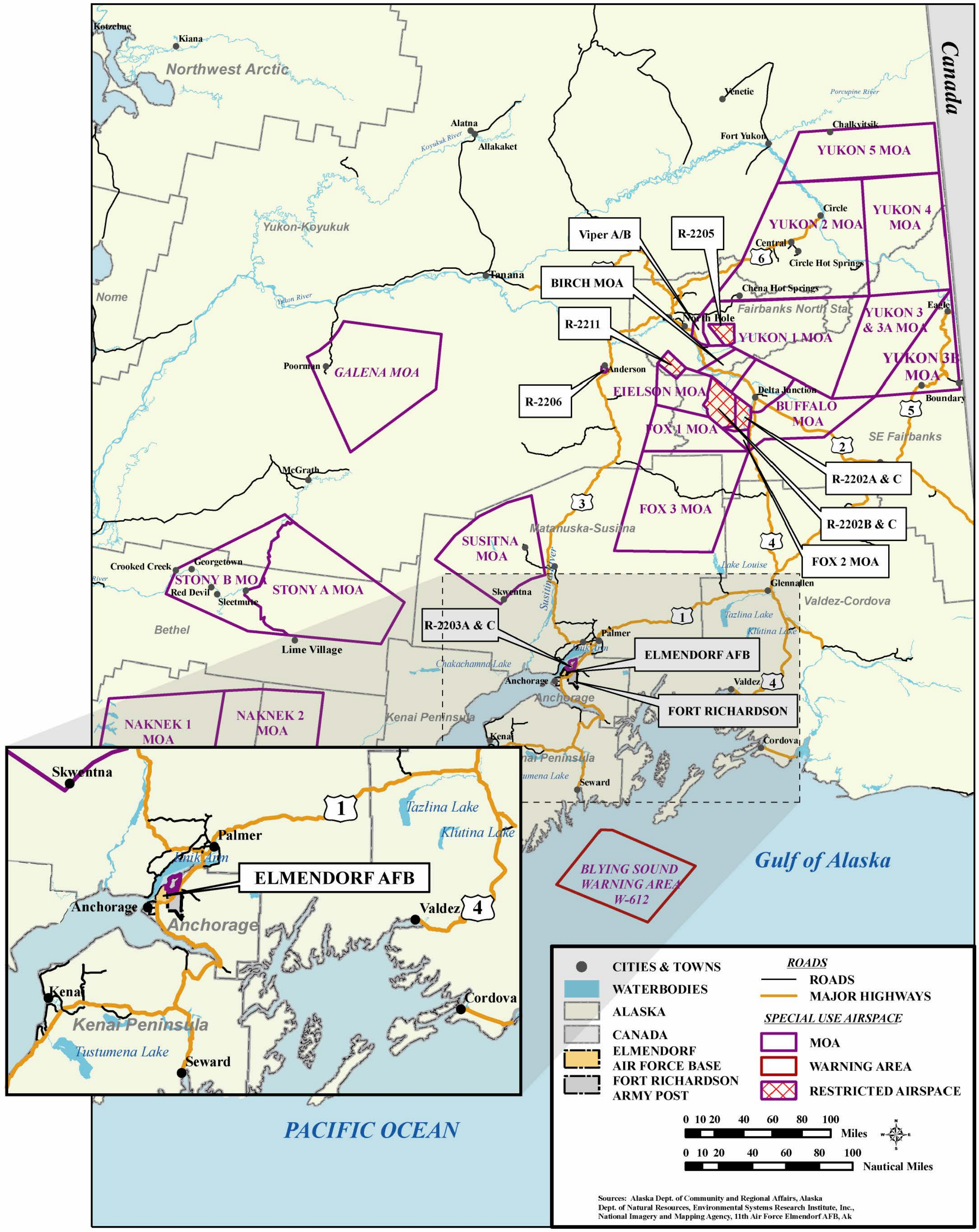
Airspace. High concentrations of Alaska Natives who live under the airspace are representative of rural populations throughout the state. Persons living under the airspace, particularly the Stony MOAs, could notice or be disturbed by increased sonic booms. This change in sonic boom activity would not be expected to damage health or other environmental resources. No disproportionately high or adverse impacts to minority or low-income communities would result from F-22A beddown or training. There would be no disproportionate health and safety risks to children.

Cumulative Consequences

Base. Cumulative effects analysis considers the potential environmental consequences resulting from “the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal of non-federal) or person undertakes such actions” (40 CFR 1508.7). Multiple federal and non-federal projects near the base and airspace were identified and evaluated to see whether cumulative impacts could occur. The analysis throughout the EA incorporates the cumulative effect of the BRAC decision to relocate one squadron of F-15C and one squadron of F-15E aircraft. The beddown of C-17 aircraft, BRAC decisions regarding C-130 aircraft, proposed transportation projects, and other

projects were cumulatively evaluated. No significant environmental consequences result from reasonably foreseeable projects that could cumulatively affect environmental resources in conjunction with the beddown of the F-22A Operational Wing.

Airspace. The airspace discussion throughout the document cumulatively incorporates the BRAC decision to relocate one squadron of F-15C and one squadron of F-15E aircraft from Elmendorf AFB. There is no cumulative effect associated with MTR improvements because the F-22A aircraft would use the MTRs less than one-half the level of existing F-15E use. Schedules for the potential natural gas pipelines under portions of the airspace were evaluated to determine whether construction schedules overlapped. No significant cumulative environmental consequences would result from reasonably foreseeable projects under the training airspace.



Elmendorf AFB is located just north of the city of Anchorage.

1.0 PURPOSE AND NEED FOR SECOND F-22A OPERATIONAL WING BEDDOWN

In 1985, Congress determined that a need existed to provide the United States Air Force (Air Force) with a next-generation fighter to replace and supplement the aging F-15C and newer F-15E fleet and to ensure air dominance well into the 21st century. Congress also determined that the F-22A would meet this need. The Air Force now proposes to establish (beddown) the Second Operational Wing of F-22A Raptors at Elmendorf Air Force Base (AFB), Alaska to support the F-22A program.

The purpose of the Elmendorf AFB-based F-22A Operational Wing is to have national assets positioned to rapidly respond to the directives of the President and Secretary of Defense and to provide the Air Force with the capability to meet mission responsibilities that include rapid worldwide deployment. This Environmental Assessment (EA) tiers from the Initial F-22 Operational Wing Beddown Environmental Impact Statement (EIS) (Air Force 2001a). Elmendorf AFB best meets the need and F-22A current operational requirements of the five original bases considered in that EIS. Elmendorf AFB has an F-15C mission and an F-15E mission with the organizational structure and basic infrastructure to support fighter aircraft. Elmendorf AFB has operational air superiority aircraft, missions, and training airspace to meet the needs for an F-22A Operational Wing.

The Elmendorf AFB beddown would involve basing 36 F-22A Primary Aircraft Inventory (PAI) and 4 Backup Aircraft Inventory (BAI); constructing new facilities, modifying existing Elmendorf AFB facilities; changing personnel; and conducting flight training operations in existing Alaskan Special Use Airspace (SUA).

Elmendorf AFB is the proposed location for the Second Operational Wing of F-22A fighter aircraft.

This EA analyzes the potential environmental consequences associated with the F-22A Operational Wing beddown according to the requirements of the National Environmental Policy Act (NEPA) of 1969, the Council on Environmental Quality (CEQ) Regulation of 1978, and 32 Code of Federal Regulations (CFR) Part 989, titled the Environmental Impact Analysis Process. 32 CFR Part 989 addresses the implementation of NEPA and directs Air Force officials to consider the environmental consequences of any proposal as part of the decision-making process.

The Proposed Action is to locate or beddown the next generation F-22A Raptor in Alaska.

1.1 Background

The F-22A Raptor is designed to ensure that America's armed forces retain air dominance. This means complete control of the airspace over an area of conflict, thereby allowing freedom to attack and freedom from attack at all times and places for the full spectrum of military operations. Air dominance provides the ability to defend American and Allied forces from enemy attack and to attack air and ground adversary forces without hindrance from enemy

aircraft. During the initial phases of deployment into an area of conflict, the first aircraft to arrive are the most vulnerable because they face the entire warfighting capability of an adversary. The F-22A's state-of-the-art technology, advanced tactics, and skilled aircrew will ensure air dominance from the outset of such situations. The F-22A has the stealth, speed, and maneuverability to overcome adversary improvements in air defenses and ensure air dominance over any battlefield.

The F-22A aircraft is a 21st century fighter designed to replace and supplement F-15C and F-15E aircraft which can be targeted by enemy air defenses at increasingly greater distances. The Air Force priority is to be equipped, trained, and ready to fulfill its combat missions as directed by the President and Secretary of Defense.

1.1.1 Aircraft Characteristics of the F-15C and F-15E

THE F-15C IS ARMED WITH THE AIM-7M SPARROW OR AIM-120 ADVANCED MEDIUM-RANGE AIR-TO-AIR MISSILES, THE AIM-9M SIDEWINDER, AND A 20-MILLIMETER CANNON.

The F-15C Eagle, an air superiority fighter, was developed in 1965 and attained initial operational capability in 1976. The aircraft was developed to arrive early during a battle and control access to the battle from the sky. These missions were to be performed frequently for short durations, with rapid airfield maintenance and quick turnaround times. During Desert Storm, the F-15C aircraft flew longer missions, refueled in flight, and provided air superiority over the battlefield to engage enemy aircraft while escorting other aircraft.

THE F-15E STRIKE EAGLE HAS BOTH AIR-TO-AIR AND AIR-TO-GROUND CAPABILITIES, INCLUDING LASER-GUIDED AIR-TO-GROUND MUNITIONS.

The F-15E Strike Eagle, a modern all-weather strike fighter, is designed for long-range interdiction of enemy ground targets deep behind enemy lines. The F-15E Strike Eagle attained initial operational capability in 1989. The F-15E is a derivative of the two-seat F-15B with the second seat equipped for a Weapon Systems Officer to work air-to-ground avionics. The F-15E is fitted with two conformal fuel tanks that hug the fuselage and produce lower drag than conventional fuel tanks. During Desert Storm, the Strike Eagle carried out deep strikes against high-value targets and provided close air support for coalition troops.

The F-15C and F-15E routinely operate at medium altitudes (20,000 to 30,000 feet above mean sea level [MSL]) and fly missions up to 2 hours in duration. Powered by two engines that each provides from 18,000 to 29,000 pounds of thrust, the F-15C and F-15E can achieve speeds for a short period of time in the 1,600 miles per hour range. The F-15C and the F-15E use power settings ranging from above 90 percent to afterburner use. F-15C and F-15E aircraft generally use afterburner with increased fuel consumption to achieve supersonic speeds. Each F-15C and F-15E is 64 feet long, with a wingspan of 43 feet, and is over 18 feet in height.

1.1.2 Aircraft Characteristics of the F-22A

The F-22A is designed to replace and supplement the F-15C and F-15E fleets. The F-22A offers a unique combination of capabilities that make it less detectable, faster, more fuel efficient, more maneuverable, and more reliable than the F-15C or the F-15E. These capabilities enable the

F-22A to reach the conflict faster, reduce danger to pilots, and provide more air power to the combat commander. The enhanced capabilities include the following:

- **Stealth**: State-of-the-art design and radar-absorbent composite materials make the F-22A much harder to detect by radar than conventional aircraft of similar size.
- **Supersonic Speed**: The F-22A can sustain supersonic speeds without the use of afterburners. This supercruise capability permits the F-22A to operate longer at higher speeds and with less vulnerability.
- **Increased Maneuverability**: The F-22A design, coupled with the ability to direct engine thrust, permits the pilot to turn more rapidly, maintain better control, and evade missile threats better than other fighter aircraft.
- **Advanced Electronics**: Highly sophisticated avionics systems are integrated throughout the F-22A to provide the pilot information from many sources and produce a clear, understandable picture of the combat situation.
- **Maintainability, Sustainability, Reliability, and Responsiveness**: Reliability and mission-readiness of the F-22A is enhanced with computerized self-tests of all systems and other maintenance features. The F-22A requires fewer personnel and equipment for maintenance and deployment compared to the F-15C or the F-15E.

THE F-22A HAS ENHANCED STEALTH, SPEED, MANEUVERABILITY, ELECTRONICS, AND MAINTAINABILITY.

The F-22A Raptor is a single-seat, all-weather, multipurpose fighter capable of both air-to-air and air-to-ground missions. Powered by two 35,000-pound thrust-class engines, the F-22A routinely operates at higher altitudes (above 30,000 feet MSL) and higher speeds than the F-15C or the F-15E. Its thrust-to-weight ratio permits the F-22A to achieve speeds needed for air-to-air combat while using lower power settings than an F-15C. F-22A characteristics make the aircraft able to launch sophisticated weapons at higher speeds and from greater distances than possible for the F-15E. The F-22A is approximately 62 feet long, with a wingspan of 44 feet, and a height of more than 16 feet.

The F-22A can carry six radar-guided AIM-120 Advanced Medium-Range Air-to-Air Missiles, two heat-seeking AIM-9 Sidewinder short-range missiles, and has a 20-millimeter multi-barrel cannon for air-to-air engagements. The F-22A has the capability to carry a variety of conventional and Long Range Stand-Off Weapons (LRSOW) for air-to-ground ordnance delivery. When performing air-to-ground missions, the F-22A can internally carry two Global Positioning System-aided 1,000-pound Joint Direct Attack Munition (JDAM) in place of two AIM-120s and two AIM-9 missiles. The Small Diameter Bomb (SDB) (Guided Bomb Unit [GBU]-39/B) is designed to provide the F-22A with multiple targeting capabilities. Training in Alaskan SUA would not include release of live air-to-air missiles. Air-to-ground training with LRSOW would include flying to launch profiles and speeds at high altitude with simulated launches where no LRSOW munitions would be released. Existing conventional ranges would be used for munitions training. Release profiles, altitudes, and speeds would be limited to keep weapon safety footprints within established ranges.

1.1.3 F-22A Development Program

1984 – 1985
Need for F-22 Identified

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1986
Congress Funds F-22 Program

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1987 – 1998
Demonstration/Validation, Engineering, and Manufacturing Development

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1997 – 2003
Testing and Evaluation
(Edwards AFB, CA)

↓

2002 – Onward
F-22 Fighter Pilot Training
(Tyndall AFB, FL)

↓

2003 – Onward
Force Development and Evaluation and Weapons School
(Nellis AFB, NV)

↓

2004 – 2007 (Onward)
Beddown of Initial F-22 Operational Wing
(Langley AFB, VA)

↓

2008 – 2012 (Onward)
Proposed Beddown of Second F-22A Operational Wing
(Elmendorf AFB, AK)

The requirement leading to development of the F-22A was identified through the process described in Air Force Instruction (AFI) 10-601, *Mission Needs and Operational Requirements Guidance and Procedures*. During the early 1980s, the Air Force assessed its tactical capabilities against projected threats and determined that a mission deficiency would emerge in the near future. Such a deficiency could jeopardize the ability of the United States (U.S.) to ensure that its forces have the freedom of action to conduct operations against opposing forces. By 1984, the Air Force had defined the requirements for an advanced tactical fighter, presented in a *Statement of Operational Need*. The first F-22A aircraft flew in 1997. Several designations have been used for the F-22A throughout the development of the aircraft. During initial experimental testing it was the XF-22. Then, the F-22 designation emphasized the air-superiority function. For a period, the designation F/A-22 was used to highlight the aircraft's attack capability. The F-22A is basically the same airframe under all these designations.

F-22A Force Development and Evaluation (FDE) flight activities began in 2003 at Nellis AFB, Nevada, after completion of Initial Operational Test and Evaluation (IOT&E) at Edwards AFB, California. FDE, like IOT&E, is a part of the overall Operational Test and Evaluation program for the F-22A. While IOT&E ensures that the F-22A meets mandatory operational capabilities, FDE tests and evaluates the aircraft and its systems to ensure that it continues to meet operational requirements for as long as the aircraft is used. FDE also explores the use of new flight techniques and tactics and develops F-22A training programs. By testing capabilities of an aircraft in tactical situations, including air-to-air, air-to-ground, and electronic combat operations, FDE provides essential input on tactics to the Weapons School and operational units. F-22A tactics developed at FDE become the training activities for the Langley AFB Initial Operational Wing, the proposed Elmendorf AFB Second Operational Wing, and future F-22A operational squadrons.

In 2003, the Air Education and Training Command began qualifying F-22A fighter pilots to fly the F-22A at Tyndall AFB. The Air Education and Training Command has advanced pilot training squadrons at Tyndall AFB, Florida. Members of these squadrons complete advanced F-22A pilot training to successfully perform the academic work and develop flying skills necessary to achieve instructor status. A number of these new instructor pilots are scheduled to be assigned to operational units that will receive F-22As, including the proposed Second Operational Wing at Elmendorf AFB.

1.1.4 Elmendorf AFB

Elmendorf AFB has had multiple squadrons at different times during its history.

Elmendorf AFB, located near Anchorage, Alaska, is part of the Pacific Air Forces (PACAF). Elmendorf AFB is the home of the Alaskan Command, 11th Air Force, Alaskan North American Air Defense region, and the 3rd Wing (3 WG). The 3 WG encompasses two squadrons of F-15Cs (42 aircraft), 18 F-15E aircraft, 16 C-130 transports, and a limited number of C-12 and E-3 aircraft. Eight C-17 transports will be beddown in 2007 (Air Force 2004a). As depicted in the insert on Figure 1.1-1, Elmendorf AFB shares a boundary with the Army's Fort Richardson. Elmendorf AFB covers 13,455 acres, with the improved areas consisting of 3,713 acres, including a 10,000-foot main runway and a 7,500-foot cross-runway. Under the Proposed Action, substantial new construction would be needed to meet requirements for two F-22A operational squadrons. Three construction options are presented in Section 2.1.

Throughout its history, Elmendorf AFB has based large numbers of aircraft to support World War II, Korean War, Vietnam War, Cold War, Gulf War, and Global War on Terror. The F-22A would be a natural continuation of aircraft based to support the U.S. worldwide interests.

Elmendorf AFB has extensive SUA for training (Figure 1.1-2). Training airspace for Elmendorf AFB aircraft includes large overland Military Operations Areas (MOAs) which provide training airspace for the F-15Cs and F-15Es as well as other aircraft. Many of these MOAs permit supersonic flight and allow the use of chaff and flares for defensive training (refer to Section 4.1.2). Existing Army Training Ranges provide for local air-to-ground training for F-15E aircraft. The Air Force expects that the F-22A would use the existing SUA and Army Ranges currently used by Elmendorf AFB in a manner similar to the F-15Cs and F-15Es currently based there. No airspace modifications are proposed for the F-22A. Chapter 2.0 of this EA describes the F-22A missions and training.

1.2 Purpose of F-22A Operational Wing Beddown at Elmendorf AFB

The overall mission of the Air Force is defense of the U.S. and fulfillment of the directives of the President and Secretary of Defense. To meet these requirements, the Air Force must develop and operate combat and support aircraft and train personnel. The purpose of the Elmendorf AFB-based F-22A Operational Wing is to be positioned to rapidly respond to directives of the President and Secretary of Defense. As is the case of the eastern U.S.-based First F-22A Operational Wing at Langley AFB, the westernmost U.S. basing of the Second F-22A Operational Wing at Elmendorf AFB provides the Air Force with the capability to meet its mission responsibilities that include rapid worldwide deployment.

The Air Force faces two challenges to providing air dominance with its current fleet of fighter aircraft. First, other nations continuously improve their aerial warfare capability by fielding newer, faster, more maneuverable aircraft, such as the MiG-29, Su-35, Rafale, Gripen, and Eurofighter. Second, potential adversaries have added sophisticated air defenses built around surface-to-air missiles that can target F-15C and F-15E aircraft more accurately and at greater distances than in the past. The F-22A has the stealth, speed, and maneuverability to overcome these challenges and ensure air dominance over any battlefield.

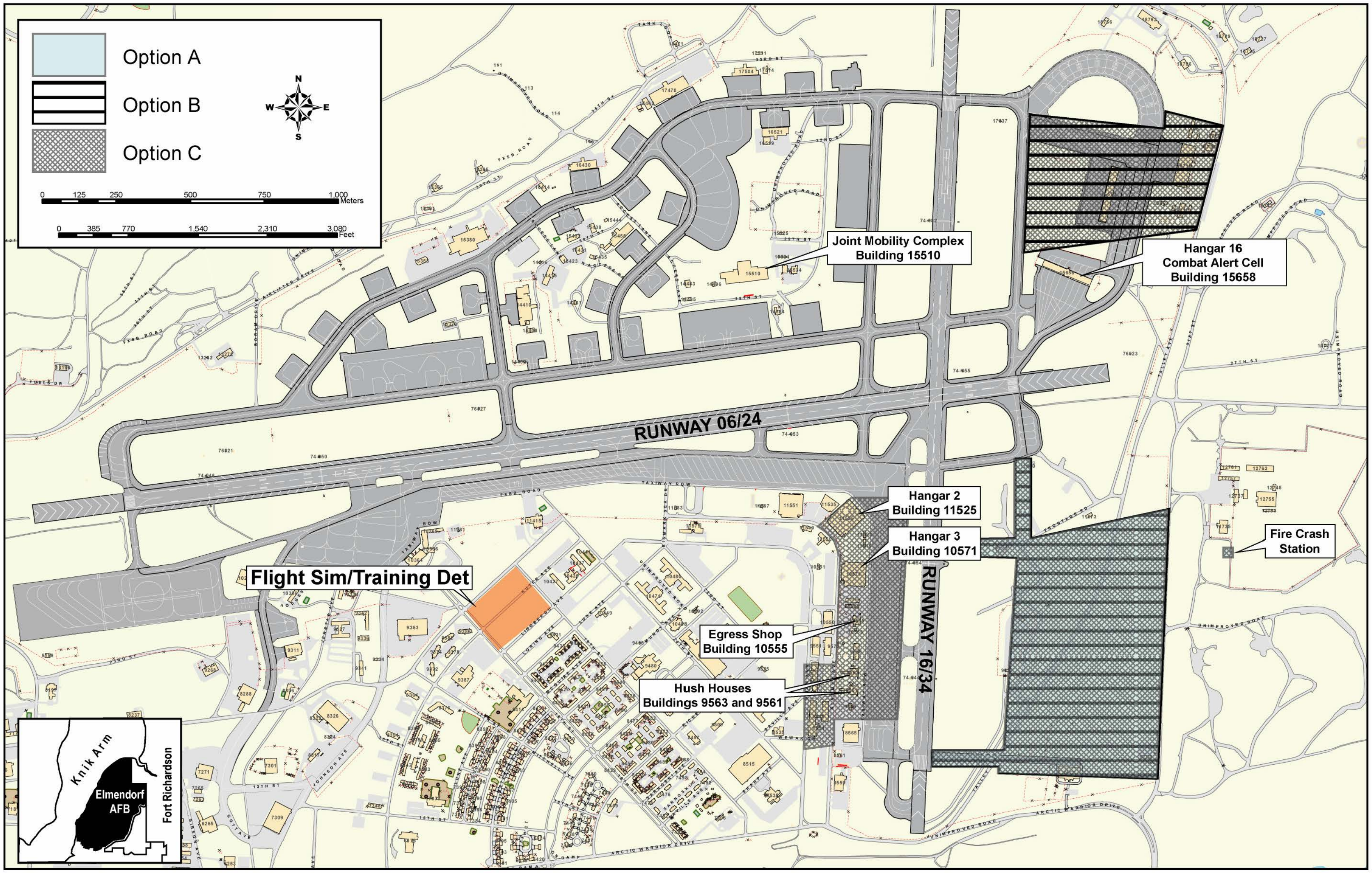


FIGURE 1.1-1. OPTIONAL DEVELOPMENT AREAS

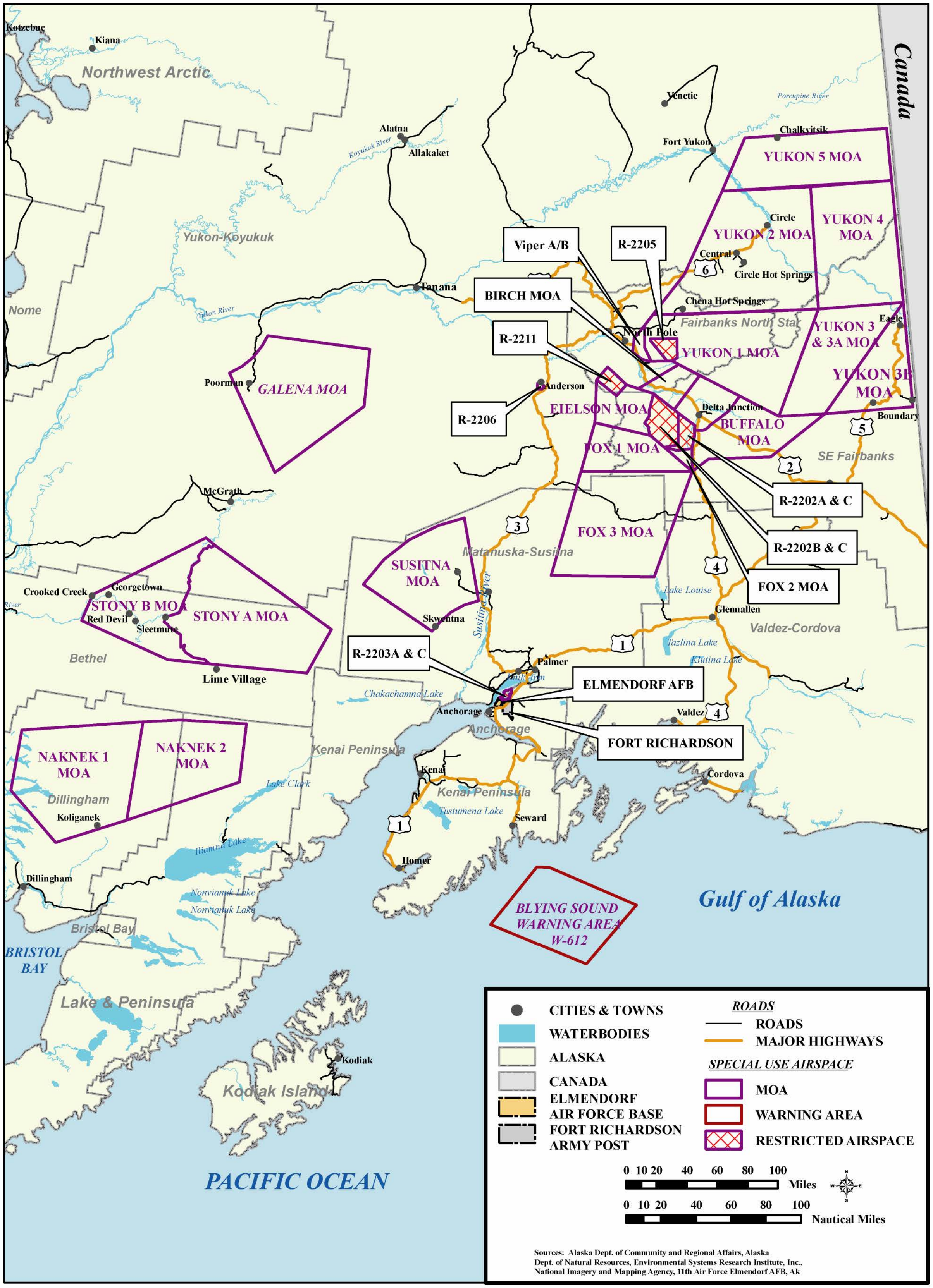


Figure 1.1-2. Training Special Use Airspace

1.3 Need for Second F-22A Operational Wing Beddown

The Air Force must establish Operational F-22A Wings that fulfill the F-22A's essential air dominance role in national defense.

Each F-22A Operational Wing must be combat-ready and able to perform its mission anywhere in the world at any time. The Second Operational Wing installation must meet the original selection criteria evaluated in the EIS for the location of the F-22 Initial Operational Wing; meet national needs for location with access to the Pacific Rim; and have the capacity at this time to beddown the Second F-22A Operational Wing. The need for an Operational F-22A Wing at Elmendorf AFB is the logical outgrowth of the F-22A development program described in Section 1.1.3.

1.3.1 Need for Elmendorf AFB F-22A Operational Wing Beddown

In November 2001, the Air Force reviewed active Air Force F-15C squadron bases to identify bases that met the needs for beddown of an F-22A Operational Wing. Six bases were considered and five bases were evaluated in an EIS for the location of the F-22 Initial Operational Wing (Air Force 2001a). Since the November 2001 review, several factors have affected the alternative bases. Those factors have been included in considering the need to beddown the F-22A Second Operational Wing:

- Eglin AFB was selected as the location for F-35 Joint Strike Fighter pilot training of all Air Force, Navy, and Marine personnel as part of the Base Realignment and Closure Act (BRAC) of 2005. Eglin will have multiple new missions and does not meet the needs for an Operational Wing at this time.
- Elmendorf AFB is losing one squadron of F-15C air superiority aircraft and one squadron of F-15E air-to-ground aircraft as a result of BRAC decisions. Since World War II, Elmendorf AFB has provided an advanced location on U.S. soil for projection of U.S. global interests. Elmendorf AFB has F-15C and F-15E missions with the organizational structure and basic infrastructure communication links to support fighter aircraft. Elmendorf is the only remaining base from those originally evaluated which meets the needs for an F-22A Operational Wing at this time.
- Langley AFB was selected as the location for the Initial Operational Wing. Facilities have been constructed, and Initial Operating Capability was achieved on 15 December 2005 at Langley AFB. Langley AFB does not meet the need for a Second Operational Wing at this time.
- Mountain Home AFB is becoming the primary location for F-15E aircraft assets as a result of BRAC 2005. This includes F-15E aircraft from Elmendorf AFB. These additional missions mean that Mountain Home AFB does not meet the needs for an F-22A Operational Wing at this time.
- Nellis AFB continues to have unique FDE requirements for one squadron of F-22A and two proposed F-35 squadrons to support testing, training, and weapons system evaluation. Nellis missions mean that it does not meet the needs for an Operational Wing at this time.

- Tyndall AFB has received a training squadron of F-22A aircraft for pilot training and to support weapons delivery activity in Warning Areas and over-water ranges in the Gulf of Mexico. It would be beneficial to Air Force missions to not concentrate most of the next generation air superiority assets at one location at this time.

Of the original bases with F-15C operational air superiority aircraft, missions, and training airspace, Elmendorf AFB is the only base which meets the original selection criteria for an Operational Wing beddown, meets national needs for location, and has the capacity at this time to beddown the Second F-22A Operational Wing.

The ultimate goal of the F-22A development and operational deployment process is to provide the Air Force with a proven, tested aircraft, as well as with tactics and operational guidance to meet mission requirements. The Initial Operational Wing is currently being established at Langley AFB, Virginia. The proposed beddown of the Second F-22A Operational Wing, as analyzed in this EA, represents the second operational step in providing these needed F-22A units.

Elmendorf AFB experience with operational squadrons of both the air superiority F-15C and primarily air-to-ground F-15E provides needed capabilities to coordinate the multi-role F-22A operational squadrons.

The Eleventh Air Force has broad national defense responsibilities.
The 3 WG includes three fighter squadrons and an extensive support team

2.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

The Proposed Action is to establish the Second F-22A Operational Wing at Elmendorf Air Force Base (AFB). This chapter describes the Proposed Action and optional beddown facility locations to accomplish the Proposed Action. The No Action Alternative, which would not beddown the F-22A at Elmendorf AFB at this time, is also discussed.

Establishment of the Second F-22A Operational Wing at Elmendorf AFB is proposed to take place over a period of approximately five years and would involve construction of facilities to support the aircraft and training personnel needed to operate and maintain the aircraft and associated facilities.

> PRIMARY AIRCRAFT INVENTORY (PAI) ARE AIRCRAFT ASSIGNED TO MEET THE PRIMARY AIRCRAFT AUTHORIZATION OR PAA. BACKUP AIRCRAFT INVENTORY (BAI) ARE AIRCRAFT ABOVE THE PAI TO PERMIT SCHEDULED AND UNSCHEDULED DEPOT LEVEL MAINTENANCE, MODIFICATIONS, INSPECTIONS AND REPAIRS, AND CERTAIN OTHER MITIGATING CIRCUMSTANCES WITHOUT REDUCTION OF AIRCRAFT AVAILABLE FOR THE ASSIGNED MISSION. BAI MAY ALSO BE REFERRED TO AS BACKUP AIRCRAFT AUTHORIZATION OR BAA.

Each of the two F-22A squadrons proposed for Elmendorf AFB would be composed of 18 Primary Aircraft Inventory (PAI) plus 2 Backup Aircraft Inventory (BAI). As such, the two squadron F-22A Operational Wing would include 36 PAI and 4 BAI aircraft. PAI consists of the aircraft authorized and assigned to perform the squadron's missions in training, deployment, and combat. BAI includes those aircraft additional to the PAI that are used as substitutes for PAI aircraft.

Unrelated to a decision on the F-22A beddown, the Base Realignment and Closure (BRAC) Act (BRAC 2005) directed that one of the two squadrons of F-15C aircraft and the single F-15E squadron be relocated from Elmendorf AFB. When completed, the BRAC action would leave one squadron of 18 PAI and 2 to 3 BAI F-15C aircraft at Elmendorf AFB

The beddown of the Second F-22A Operational Wing would take place in the following stages:

- 1st Operational Squadron in Fiscal Year (FY) 2008
- 2nd Operational Squadron in FY 2009

> ***ACTIVITIES AFFECTING ELMENDORF AFB***
> - BEDDOWN TWO F-22A OPERATIONAL SQUADRONS OVER A PERIOD OF APPROXIMATELY FIVE YEARS.
> - CONDUCT FLYING SORTIES AT THE BASE FOR TRAINING AND DEPLOYMENT.
> - CONSTRUCT THE FACILITIES AND INFRASTRUCTURE NECESSARY TO SUPPORT THE F-22A OPERATIONAL WING.
> - IMPLEMENT THE PERSONNEL CHANGES AT THE BASE TO CONFORM TO THE F-22A WING'S REQUIREMENTS.
>
> ***ELEMENTS AFFECTING ALASKAN AIRSPACE***
> - CONDUCT F-22A TRAINING FLIGHTS IN MOAS, AIR TRAFFIC CONTROL ASSIGNED AIRSPACE (ATCAA), AND RANGES.
> - EMPLOY DEFENSIVE COUNTERMEASURES (CHAFF AND FLARES) IN AIRSPACE AUTHORIZED FOR THEIR USE.
> - TRAIN FOR EMPLOYMENT OF LONG RANGE STAND-OFF WEAPONS AND OTHER MUNITIONS.

F-22A training is needed to maintain operational capabilities. The F-22A needs both air-to-air and air-to-ground training airspace and range facilities for pilots to achieve and maintain skills. Elmendorf AFB has adequate training airspace and does not propose any airspace changes. Associated Army ranges provide limited air-to-ground capabilities for close-in F-22A training. Long Range Stand-Off Weapons (LRSOW) training can be simulated in existing airspace.

The proposed beddown of the F-22A Operational Wing would involve several activities at Elmendorf AFB. These activities would occur at the base and in the associated training airspace.

This chapter presents three construction options for facilities at Elmendorf AFB. This chapter also presents

proposed activities at the base, training use of Special Use Airspace (SUA), use of air-to-ground ranges, and personnel associated with an Elmendorf AFB F-22A Second Operational Wing beddown. The No Action Alternative is described in conformance with the Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations [CFR] 1502.14(d)) in Section 2.2.4. Alternatives considered but not carried forward for analysis are discussed in Section 2.3.

2.1 Elements Affecting Elmendorf AFB

The proposed beddown of an F-22A Operational Wing at Elmendorf AFB could affect three aspects of the base:

1. The beddown and flight activity of a new aircraft with different performance characteristics from existing aircraft could affect the base and its environs. This section describes existing and proposed flight activities near the base.
2. The beddown would require the planning, design, and construction of facilities at Elmendorf AFB over a period of years. Three options for beddown facilities are described in this section.
3. The beddown would affect the numbers and responsibilities of base personnel. The proposed personnel change is described in this section.

Base Flight Activities. F-22A aircraft would use the base runways and fly in the base environs similar to the comparably sized F-15C and F-15E aircraft do today. This includes take-off and landings, training, and deployments.

The United States Air Force (Air Force) anticipates that, by completion of the beddown, the Elmendorf F-22A Operational Wing would fly approximately 5,500 sorties per year from Elmendorf AFB. Additionally, the Air Force could continue occasional use of other Alaskan locations at the same levels currently used by the F-15C and F-15E aircraft. Based on projected requirements and deployment patterns under the Aerospace Expeditionary Forces (AEF) program, the F-22A Operational Wing would fly an additional 2,800 sorties at overseas airfields during deployments or at other locations for exercises or in preparation for deployments.

A SORTIE IS THE FLIGHT OF A SINGLE AIRCRAFT FROM TAKEOFF TO LANDING.

Operational F-22A squadrons proposed for Elmendorf AFB would be integrated into the Air Force's Expeditionary Air Force (EAF) Construct. The EAF Construct grew out of the need for the United States (U.S.) to deploy forces worldwide despite the reduction in U.S. overseas basing and personnel. Under the EAF, the Air Force has divided its forces into 10 AEFs and 2 Aerospace Expeditionary Wings to make worldwide deployments more predictable and manageable. An AEF is a "package" (group of different types of aircraft with a mixture of capabilities suited to the tasking) deployed to overseas locations for about 120 days. These AEFs consist of wings or squadrons from multiple U.S. bases that operate as a unit or are integrated with other forces overseas. Pre- and/or post-deployment training, at locations other than a "home" base, also occurs for about another 30 days out of the year. Squadrons or wings at the bases are rotated into the AEF program on a 20-month cycle. Elmendorf AFB's F-15C and F-15E squadrons are currently part of the AEF program.

On average, each squadron would be deployed for 165 days per AEF cycle (120 days AEF and 45 days pre- or post-AEF training). In addition, each squadron would participate in training

exercises and operate out of another U.S. or overseas base for an average of one week per year, flying another 220 sorties at remote locations other than Elmendorf AFB. Due to seasonal constraints in Alaska (e.g., long daylight hours in summer), F-15Cs or F-15Es from Elmendorf AFB occasionally deploy to southern bases to meet training requirements. Some of the F-22A sorties while deployed would involve ordnance delivery training or missile firing at approved ranges such as the Nellis Range Complex in Nevada, Utah Test and Training Range, or Eglin AFB ranges, including over-water ranges in the Gulf of Mexico.

Due to long hours of darkness during the winter months, aircrews operating from Elmendorf AFB can fulfill night-flying requirements without flying during environmental night (after 10:00 p.m. and before 7:00 a.m.).

Elmendorf AFB F-22As would fly the same percentage (30 percent) of sorties after dark (i.e., about one hour after sunset) as required for the F-15Cs and F-15Es under the Air Force's initiative to increase readiness. Aircrews operating from Elmendorf AFB can normally fulfill the annual night flying requirements during winter months without flying after 10:00 p.m. or before 7:00 a.m. to be consistent with the Elmendorf AFB noise abatement program.

The F-15Cs and F-15Es at Elmendorf AFB use afterburner for takeoff the majority of the time, depending upon the seasons and factors such as temperature and humidity. F-22A larger engines and improved aerodynamics will reduce the number of afterburner takeoffs by 95 percent as compared to current F-15C and F-15E operations.

Elmendorf AFB Facilities. The Elmendorf AFB beddown is for an Operational Wing of F-22A aircraft. The F-22A is a new weapon system. As such, the F-22A requires additional or upgraded facilities to ensure the combat readiness and capability of the system. These new facilities will provide for and protect the characteristics noted in Section 1.1.2, including stealth, higher performance engines, advanced electronics, and maintenance procedures.

Base Realignment and Closure (BRAC) will relocate one F-15C squadron and one F-15E squadron from Elmendorf AFB. The departure of these aircraft permits the possible reuse of some base facilities and provides space that had been previously used by the departing squadrons.

One existing F-15C squadron and one F-15E squadron would relocate from Elmendorf AFB as part of BRAC.

There are three options for facilities to accomplish the Proposed Action. The three options for base facilities take into consideration the BRAC action in the identification of facilities and locations to meet F-22A beddown requirements. Table 2.1-1 summarizes the facility requirements for Options A, B, and C. Sections 2.1.1 through 2.1.3 detail the activities, facilities, and personnel for each option.

Table 2.1-1. Summary of Facility Requirements

Number of Projects	*Project Type*	*Building Square Feet*	*Estimated Facility Cost*
Option A – Construction of New Fighter Town East (FTE) Facilities			
19	14 New Facilities 1 Renovation 4 Infrastructure	598,814	$402 million
Option B – Renovation of F-15E Facilities and Construction of New FTE Facilities			
19	13 New Facilities 3 Renovation 3 Infrastructure	423,663	$323 million
Option C – Renovation of F-15C and F-15E Facilities and Construction of New FTE Facilities			
21	13 New Facilities 5 Renovation 3 Infrastructure	379,080	$325 million

2.1.1 Option A Activities, Facilities, and Personnel

Option A Activities. The BRAC decision to draw down one F-15C squadron and one F-15E squadron will reduce total fighter aircraft based at Elmendorf by 42 PAI plus BAI aircraft. The proposed beddown of 36 PAI and 4 BAI F-22A aircraft would backfill the number of aircraft assigned to Elmendorf AFB. The F-22A Second Operational Wing would be comprised of two squadrons of 18 PAI aircraft each. The number of F-22A sorties would be as described in Section 2.1.

Table 2.1-2 presents the types and number of aircraft currently assigned and proposed for Elmendorf AFB. This table permits a comparison of current aircraft assignments and proposed F-22A beddown assignments.

Table 2.1-2. Baseline and Proposed Aircraft (PAI) Assigned to Elmendorf AFB

Aircraft Type	Number Assigned *Baseline*	Number Assigned *Proposed*
F-15C	42	18
F-15E	18	0
F-22A	0	36
C-17[1]	8	8
C-130[2]	18	16
C-12	3	3
E-3A	2	2

Note: 1. Air Force 2004a.
2. Beddown as part of Air National Guard and BRAC actions.

Elmendorf AFB supports operations of F-15C, F-15E, C-12, C-17, C-130, E-3A, and aero-club based aircraft, as well as a range of transient users. On an annual basis, the installation has supported the levels of aviation operations shown in Table 2.1-3. An operation can be a take-off or departure, a landing or arrival, or a touch-and-go within a closed pattern around the airfield.

Table 2.1-3. Elmendorf AFB Airfield Annual Operations

Fiscal Year	*Number of Operations*
2000	65,816
2001	62,312
2002	52,924
2003	61,969
2004	44,318
2005	41,340

Operations conducted in FY 2004 and 2005 were influenced by several external factors. In FY 2004, many assigned units were deployed overseas. In FY 2005, major runway construction occurred. Operations staff at the 3rd Wing (3 WG) indicates that traffic handled in FY 2003 is most representative of the installation's annual demand.

Option A Facilities. Option A would develop new facilities to house both squadrons of F-22A aircraft in the southeast portion of the base (Figure 2.1-1). This development, identified in the Base's Strategic Plan as Fighter Town East (FTE), would include a total of 19 construction, renovation, or infrastructure improvement projects implemented over the period from 2006 to 2009 (Table 2.1-4) with an estimated cost of $402 million. Construction in this location would consolidate all F-22A mission facilities, provide opportunities for future expansion, and not require any waivers from flight safety regulations. Option A would include construction of 14 new facilities with a total square footage of 598,814. Option A also includes demolition of 2 facilities; 9637-Sentry Gatehouse as part of the Low Observable Project and 10641-Igloo, totaling 5,500 square feet. Option A includes the construction of approximately 22.0 acres of new taxiway and apron and infrastructure. The option would also call for the renovation of the Egress Shop.

Most construction would occur in 2007 and 2008, although some projects would continue through 2009. The squadron operations/six bay hangars and flow through weather shelters would not be available until 2009 or 2010, depending on funding. In total, the construction, renovation, and infrastructure improvements for Option A would affect about 50 acres. Affected acres represent the area covered by the construction footprints of the proposed facilities plus the surrounding lands where construction-related clearing and grading would occur. Infrastructure upgrades, such as connecting new facilities to water and power systems, would also count in the affected area. No construction is expected at any other locations which may be used occasionally as forward operating bases.

Option A would construct new facilities on previously disturbed land to consolidate F-22A squadrons in Fighter Town East.

Figure 2.1-1. Option A Location

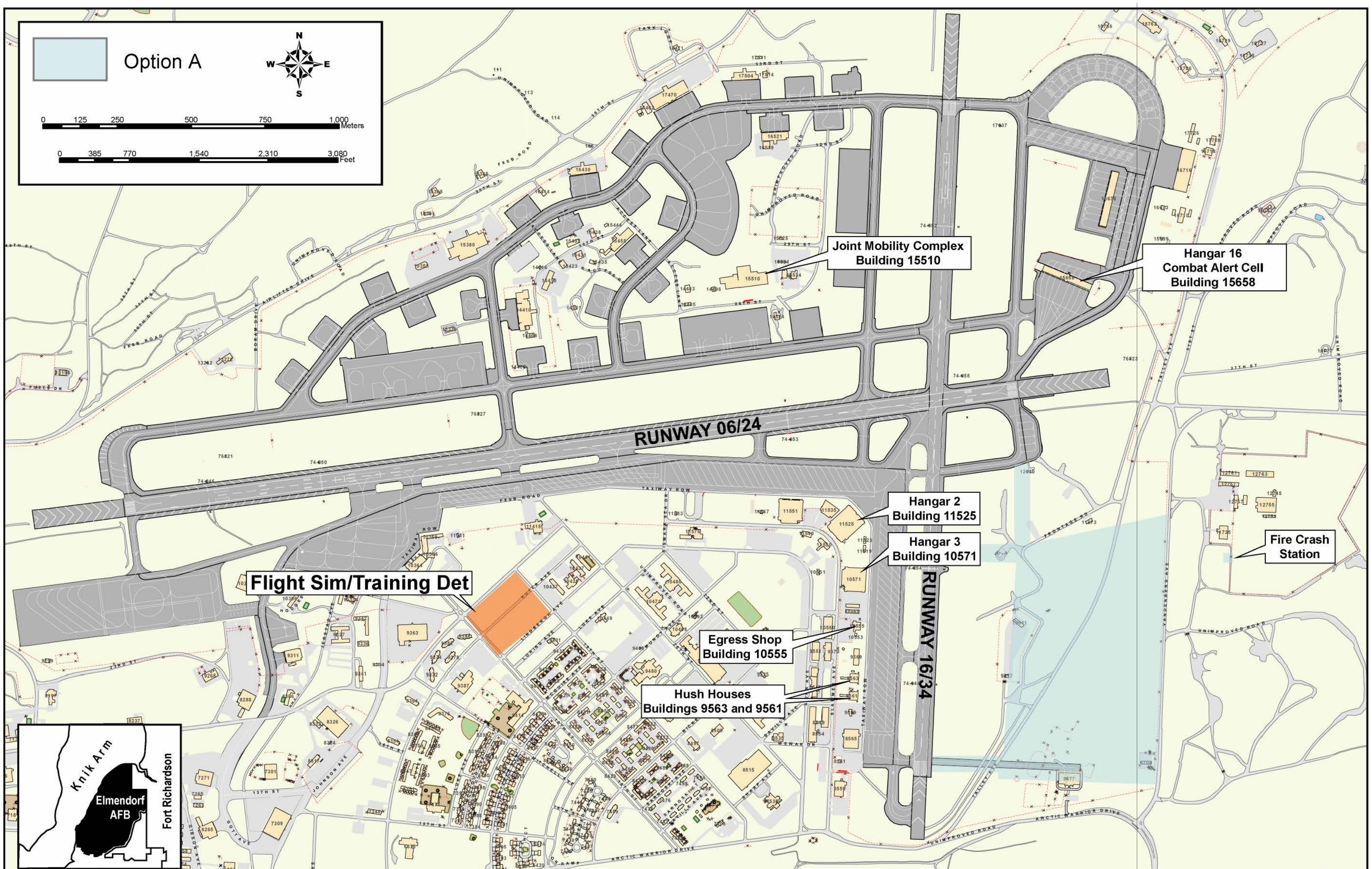


Table 2.1-4. Option A Facility Requirements

Project Name	*Building Square Feet*
Fiscal Year 2007 Projects	
Corrosion Control, Low Observable, Composite Repair Facility, Phase 1	37,555
Igloos (replacements for Building 10641 to be demolished)	4,740
Fighter Town East (FTE) Infrastructure (Phase I)	26,545 linear feet or 2.44 acres
Fiscal Year 2007 Total	**42,295**
Fiscal Year 2008 Projects	
Flight Simulator	25,618
Field Training Detachment Facility	13,606
Corrosion Control, Low Observable, Composite Repair Facility, Phase 2	40,892
Jet Engine Inspection and Maintenance Facility	33,734
Aerospace Ground Equipment (AGE) Maintenance Shop	11,055
Weapons Release Systems Shop and Alternate Mission Equipment Storage	31,775
Munitions Load Crew Training Facility	27,610
4-Bay Flow through Weather Shelter (FTE)	26,253
8-Bay Flow through Weather Shelter (FTE)	51,484
Squadron Operations/Aircraft Maintenance Unit (AMU)/6 Bay Hangar	72,183
Apron and Taxiway	14.5 acres
Fire/Crash Station	13,972
Egress Shop - Building 10555 - Renovations[1]	
Squadron Operations/Aircraft Maintenance Unit (AMU)/ 6 Bay Hangar	72,183
10-Bay Flow through Weather Shelter (FTE)	64,100
Additive Apron (Phase II)	4.5 acres
FTE Infrastructure (Phase II)	0.55 acres
Combat Alert Cell	20,570
Fiscal Year 2008 Total	**556,519**
Project Totals	**598,814**

Note: 1. Renovations do not include increases to square footage.

Construction of the four flow-through aircraft weather shelters, two hangars, and taxiway/apron modifications represent the most substantial construction projects proposed at Elmendorf AFB. These projects account for 47 percent of the affected acres and would be constructed outside of the clear zone east of Runway 16/34.

Option A also includes three new military construction (MILCON) projects constructed outside of the flightline and FTE area. A Flight Simulator facility and a Field Training Detachment facility would be constructed adjacent to the newly constructed C-17 Flight Simulator within the area between 18th and 19th Streets and Fighter Drive and Lindbergh Avenue. Additional munitions storage facilities would be constructed on the north side of the base at the Six Mile Munition Site to replace the capability lost with the demolition of Building 10641.

Demolition Activities. Prior to demolition of the two facilities, Elmendorf AFB would contract to have any asbestos-containing materials and lead-based paint removed and properly disposed of in accordance with federal and state regulations. Site preparation would include establishing a buffer zone around the involved facilities. The proposed demolition would include complete dismantling and removal of all facility structures, equipment and machinery, in accordance with applicable regulatory requirements to ensure proper handling and disposition of the waste. All utilities would be capped or disconnected. Materials from all facilities proposed for demolition would be recycled to the greatest extent practicable.

The demolition contractor would dispose of the remaining materials in an approved landfill in accordance with state and local regulations and utilizing an established haul route for equipment delivery and debris removal. The demolition would involve minimal ground disturbance and any areas that may be disturbed by the demolition would be restored to prevent any long-term soil erosion. Frequent spraying of water on exposed soil during ground disturbance and demolition activities, proper soil stockpiling methods, and prompt replacement of ground cover or pavement are standard construction procedures that could be used to minimize the amount of dust generated during demolition.

Renovation and Construction Activities. With the start of building construction, each building site would be graded and sediment and erosion controls would be installed. These standard construction practices would include the installation of a silt fence, storm drain inlet protection, temporary sediment traps, and diversion dikes within project limits prior to commencement of any on-site work. All development activities would be performed in accordance with current security and force protection requirements.

Prior to construction or demolition at any site, a construction laydown area and haul route would be established and coordinated with 3rd Civil Engineering Squadron (3 CES). Appropriate erosion and siltation controls would be implemented and maintained in effective operating condition prior to, and throughout all construction and demolition activities.

Similarly, fugitive dust would be controlled by the use of standard construction practices. In all cases where construction disturbs the existing vegetation or other ground surface, the contractor would revegetate the area as approved by the base or restore the surface as directed by the base.

The Air Force will ensure that a proper Base Civil Engineer Work Clearance Request is processed and routed through 3 CES/CEV for each construction area in accordance with 3 WG Instruction 32-1007 (2006).

Option A Personnel. Beddown of the Second F-22A Operational Wing would require personnel to operate and maintain the wing and to provide necessary support services. Fewer personnel, particularly for maintenance, would be needed for an F-22A squadron than for an equivalent F-15C or F-15E squadron. For Elmendorf AFB, the F-22A personnel positions would be drawn from the equivalent positions associated with existing manpower authorizations. As such, total on-base personnel would be reduced by 669 positions from the personnel numbers associated with the departing F-15C and F-15E squadrons. Table 2.1-5 details the manpower requirements to support the F-22A wing.

Table 2.1-5. Manpower Requirements

	Manpower Requirements			
	Officer	*Enlisted*	*Civilian*	*Total*
F-15C[1]	57	722	34	813
F-15E[1]	71	698	33	802
F-22A[2]	92	661	193	946

Note: 1. Requirements for one squadron.
2. Requirements for two squadrons.

2.1.2 Option B Activities, Facilities, and Personnel

Option B Activities. Under Option B, as with Option A, 36 PAI and 4 BAI F-22A aircraft would be assigned to Elmendorf AFB. The number of annual sorties would be the same as those described in Section 2.1.

Option B Facilities. Option B combines renovation and construction to efficiently achieve the Proposed Action. Option B is the Air Force's preferred beddown alternative. Option B utilizes or modifies existing F-15E facilities (Hangars 15 and 17) to provide the ability to accept earlier delivery of the F-22A than Option A. New F-22A facilities would be constructed outside the clear zone with the majority of them located in the FTE area. Construction outside the clear zone improves on-base safety. Flight Simulator/Field Training Detachment, propulsion capabilities, egress bay, armament maintenance, and Alternate Mission Equipment storage would be constructed as would be required for Option A. Aerospace Ground Equipment facilities and security/intelligence management information system upgrades would also be required. This development would include construction of 13 new facilities totaling 423,663 square feet and renovation of 3 buildings and 3 infrastructure improvement projects. These projects would be implemented over the period from 2006 to 2009 (Table 2.1-6) at an estimated cost of $323 million. Figure 2.1-2 presents the location for these facilities under Option B. An estimated 30 acres would be disturbed for construction and facilities under this option.

Table 2.1-6. Option B Facility Requirements

Project Name	*Building Square Feet*
Fiscal Year 2007 Projects	
Corrosion Control, Low Observable, Composite Repair Facility, Phase 1	37,555
Igloos (replacements for Building 10641 to be demolished)	4,740
Fighter Town East (FTE) Infrastructure (Phase I)	26,545 linear feet or 2.44 acres
Building 16716 (Hangar 15) - Renovations[1]	73,421
Building 16670 (Hangar 17) - Renovations[1]	49,557
Fiscal Year 2007 Total	**42,295**
Fiscal Year 2008 Projects	
Flight Simulator	25,618
Field Training Detachment Facility	13,606
4-Bay Flow through Weather Shelter (North Side)	26,253
Corrosion Control, Low Observable, Composite Repair Facility, Phase 2	40,892
Jet Engine Inspection and Maintenance Facility	33,734
Aerospace Ground Equipment (AGE) Maintenance Shop	11,055
Weapons Release Systems Shop and Alternate Mission Equipment	31,775
Weapons Load Training Facility	27,610
10-Bay Flow through Weather Shelter (FTE)	64,100
Squadron Operations/Aircraft Maintenance Unit (AMU)/ 6 Bay Hangar (FTE	72,183
Apron and Taxiway	14.5 acres
Fire/Crash Station	13,972
Egress Shop - Building 10555 - Renovations[1]	
FTE Infrastructure (Phase II)	0.55 acres
Combat Alert Cell	20,570
Fiscal Year 2008 Total	**381,368**
Project Totals	**423,663**

Note: 1. Renovations do not include increases to square footage .

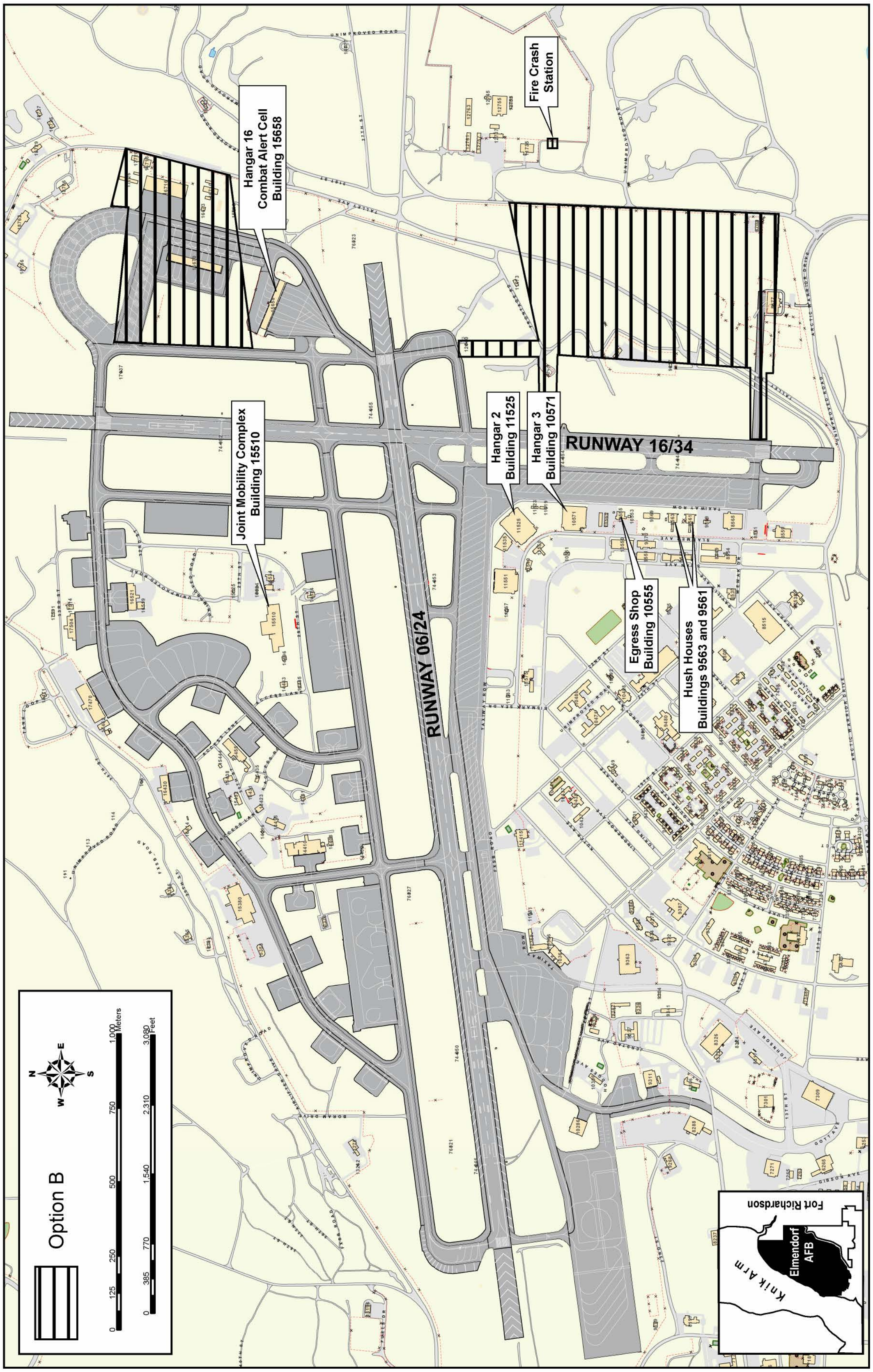


Figure 2.1-2. Option B Locations

Demolition, Renovation, and Construction Activities. Demolition activities, including asbestos and other hazardous materials would be treated the same as described for Option A. Materials recycling, soils stockpiling, and waste disposal for Option B would be as described under Option A. Grading, sediment control, security, fugitive dust control, and other practices described for Option A would be applicable for Option B.

Option B Personnel. Option B personnel requirements would be the same as those associated with Option A. Personnel would have some differences in job location and on-base commute pattern in response to the location of facilities to support the F-22A beddown.

2.1.3 Option C Activities, Facilities, and Personnel

Option C Activities. Option C aircraft assigned to Elmendorf AFB and the number of annual sorties would be the same as those described in Section 2.1.

Option C Facilities. Option C uses and/or modifies facilities vacated by the BRAC relocation of one squadron of F-15E (Hangars 15 and 17) and one squadron of F-15C aircraft (Hangars 2 and 3). New F-22A facilities would be constructed in the FTE area. Aircraft storage locations would be spilt into three areas and away from existing maintenance facilities. A Flight Simulator facility and a Field Training Detachment facility would be constructed adjacent to the newly constructed C-17 Flight Simulator. This option would include construction of 13 new buildings, renovation of 5 existing buildings, and 3 infrastructure improvement projects. These projects, totaling 379,080 square feet would be implemented for facilities over the period from 2006 to 2009 (Table 2.1-7) at an estimated cost of $325 million. Option C locates F-22A aircraft in a clear zone and results in an eventual split in fighter aircraft on-base operations with a potential increased manpower use to support the multiple locations. Figure 2.1-3 locates these facilities under Option C. An estimated 18 acres would be disturbed for construction and facilities under this option.

Demolition, Renovation, and Construction Activities. Demolition activities, including asbestos and other hazardous materials would be treated the same as described for Option A. Materials recycling, soils stockpiling, and waste disposal for Option C would be as described under Option A. Grading, sediment control, security, fugitive dust control, and other practices described for Option A would be applicable for Option C.

Option C Personnel. Option C personnel requirements are projected to be the same as those associated with Option A. Personnel would have some differences in job location in the co-located facilities and increased vehicular travel among the sites could be required to support the dispersed operations. There would be some difference in on-base commute pattern in response to the location of different facilities to support the F-22A beddown.

Table 2.1-7. Option C Facility Requirements

Project Name	*Building Square Feet*
Fiscal Year 2007 Projects	
Corrosion Control, Low Observable, Composite Repair Facility, Phase 1	37,555
Igloos (replacements for Building 10641 to be demolished)	4,740
Fighter Town East (FTE) Infrastructure (Phase I)	26,545 linear feet or 2.44 acres
Building 16716 (Hangar 15) - Renovations[1]	73,421
Building 16670 (Hangar 17) - Renovations[1]	49,557
Fiscal Year 2007 Total	**42,295**
Fiscal Year 2008 Projects	
Flight Simulator	25,618
Field Training Detachment Facility	13,606
4-Bay Flow through Weather Shelter (North Side)	26,253
Corrosion Control, Low Observable, Composite Repair Facility, Phase 2	40,892
Jet Engine Inspection and Maintenance Facility	33,734
Aerospace Ground Equipment (AGE) Maintenance Shop	11,055
Weapons Load Training Facility	27,610
Munitions Loading Crew Training Facility	27,600
10-Bay Flow through Weather Shelter (FTE)	64,100
Apron and Taxiway	14.5 acres
Fire/Crash Station	13,972
Egress Shop - Building 10555 - Renovations[1]	
Building 10571 (Hangar 3) - Renovations[1]	
Weapons Release Systems Shop and Alternate Mission Equipment	31,775
Building 11525 (Hangar 2) - Renovations[1]	
FTE Infrastructure (Phase II)	0.55 acre
Combat Alert Cell	20,570
Fiscal Year 2008 Total	**336,785**
Project Totals	**379,080**

Note: 1. Renovations do not include increases to square footage.

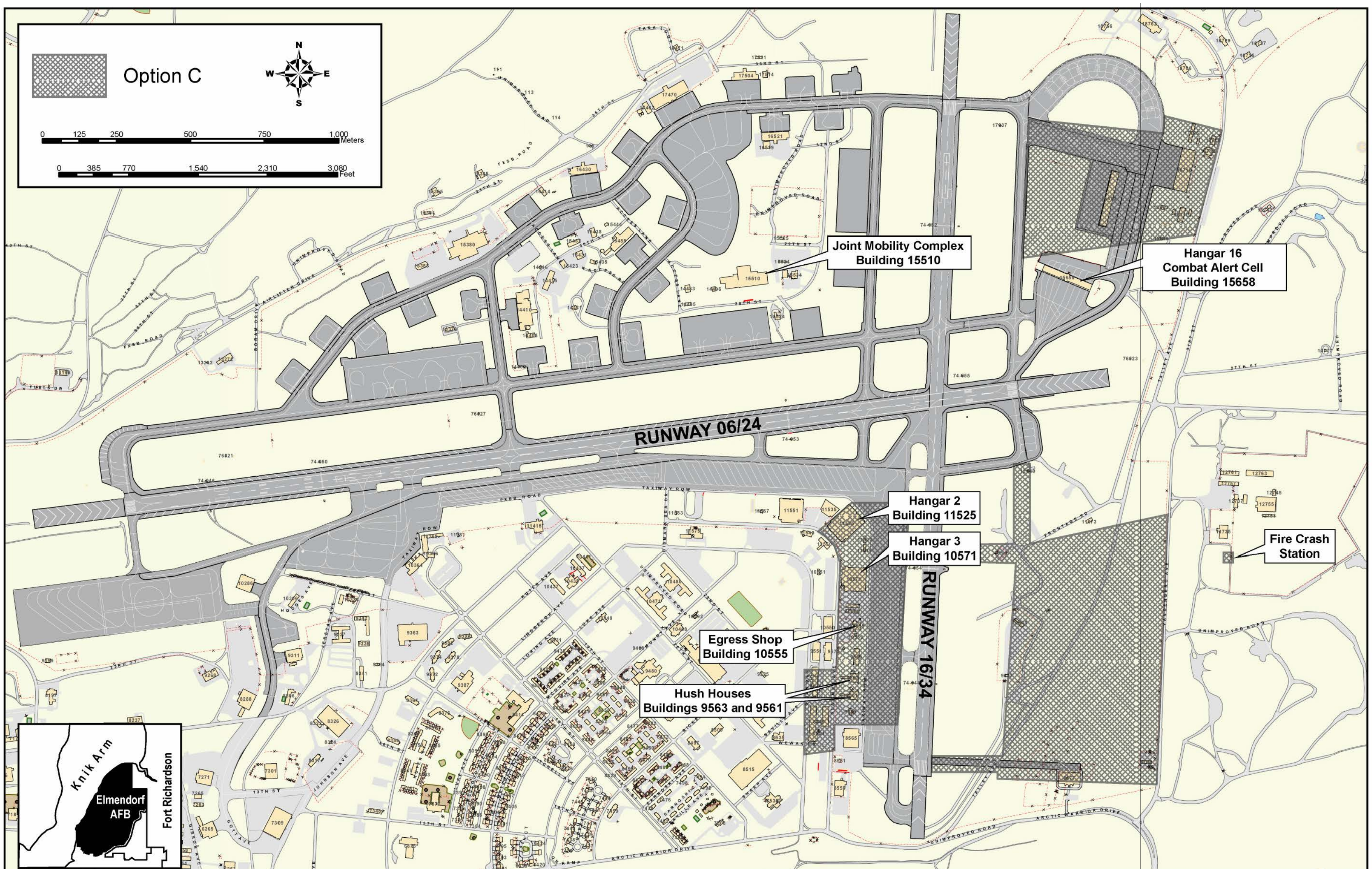


Figure 2.1-3. Option C Locations

2.1.4 No Action Alternative at Elmendorf AFB

No Action for this Environmental Assessment (EA) means no beddown of the Second F-22A Operational Wing would occur at Elmendorf AFB at this time. Analysis of the No Action Alternative provides a benchmark and enables decision-makers to compare the magnitude of the environmental effects of the proposal. Section 1502.14(d) of the National Environmental Policy Act (NEPA) requires an EA to analyze the No Action Alternative. In this case, as a result of BRAC action, one F-15C squadron and one F-15E squadron are scheduled to be relocated from Elmendorf AFB. If No Action resulted in no F-22A aircraft being assigned to Elmendorf AFB, there would be no F-22A related personnel changes and no facility construction.

Eleventh Air Force mission requirements would necessitate a review of the schedule for implementation of the required BRAC action. For this EA, No Action is the baseline condition, which currently has two squadrons of F-15C and one squadron of F-15E aircraft based at Elmendorf AFB. Taking no action could have local impacts and negatively affect the overall program for integrating the F-22A into the Air Force inventory. This could delay the fielding of the F-22A for operations and deployment. Delaying action could also add cost to the overall program.

2.2 Elements Affecting Alaskan Airspace

F-22As at Elmendorf AFB would conduct similar missions and training programs as the F-15Cs and some of the same missions and training programs of the F-15Es. The Air Force expects that the F-22A would use the training airspace associated with Elmendorf AFB in a manner similar to the F-15Cs and F-15Es currently based there. All F-22A flight activities would take place in existing airspace; no airspace modifications are proposed for the F-22A at this time.

There are five types of Alaskan training airspace used by Elmendorf AFB F-15C and F-15E aircraft for training. Figure 2.2-1 displays the types of airspace. Airspace managed by Elmendorf AFB associated with this proposed F-22A beddown includes Military Operations Areas (MOAs), Air Traffic Control Assigned Airspaces (ATCAAs), Military Training Routes (MTRs) and Warning Areas. Restricted airspace and the ranges supporting F-15E training are provided by joint use ranges at Stuart Creek (R-2205) and Oklahoma Ranges. Blair Lakes Range (R-2211) is exclusively used by the Air Force.

Operational requirements and performance characteristics of the F-22A dictate that most training would occur in MOAs and ATCAAs. MOAs are established by the Federal Aviation Administration (FAA) to separate military training aircraft from non-participating aircraft (those not using the MOA for training). When a MOA is active, the FAA routes other air traffic around it. Nonparticipating military and civil aircraft flying under visual flight rules may transit an active MOA by employing see-and-avoid procedures. When flying under instrument rules, nonparticipating aircraft must obtain an air traffic control clearance to enter an active MOA.

An ATCAA is airspace, often overlying a MOA, extending from 18,000 feet above mean sea level (MSL) to the altitude assigned by the FAA. Assigned on an as-needed basis and established by a letter of agreement between a military unit and the local FAA Air Route Traffic Control Center (ARTCC), each ATCAA provides additional airspace for training. ATCAAs are released to military users by the FAA only for the time they are to be used, allowing maximum access to the airspace by civilian aviation.

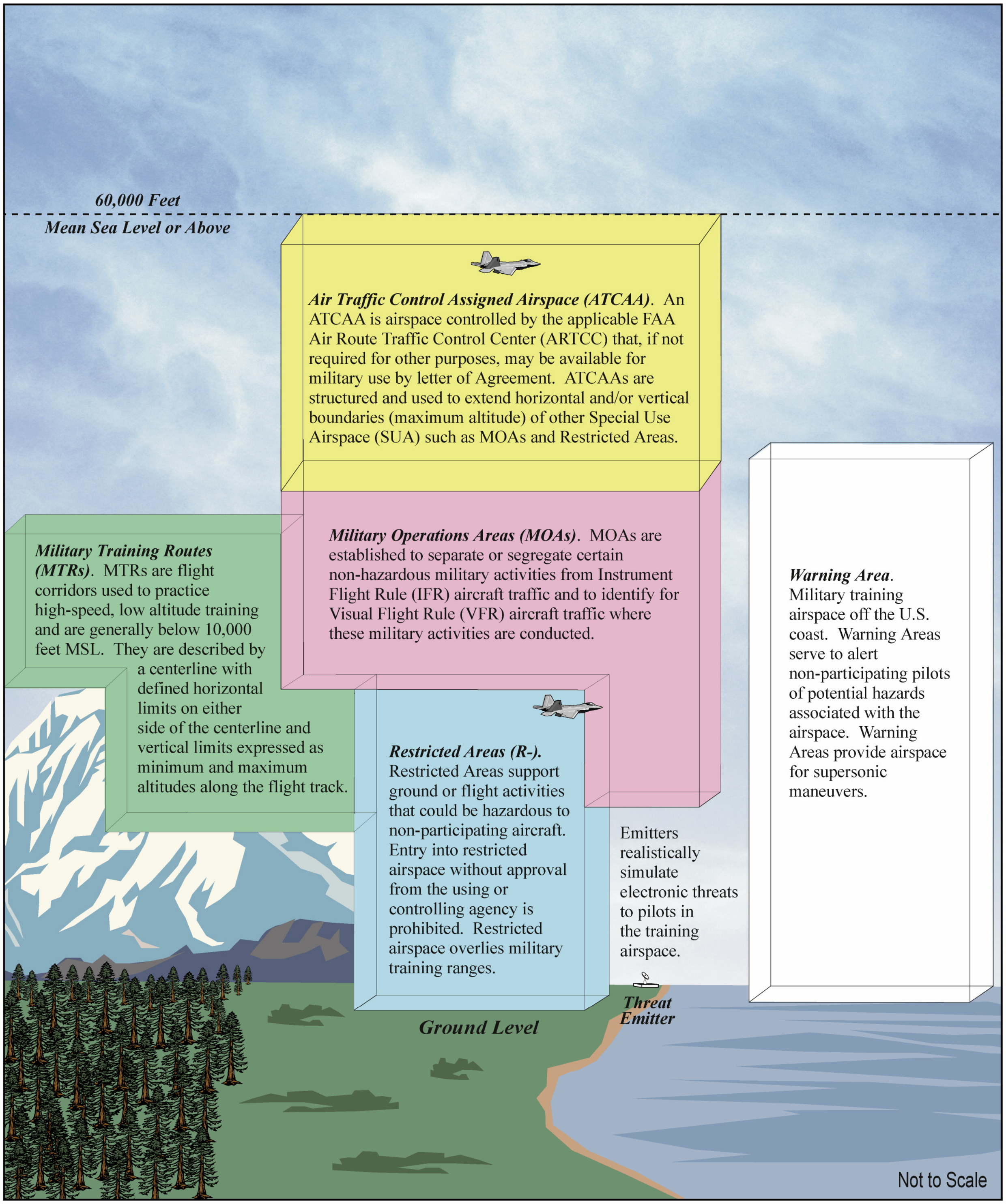
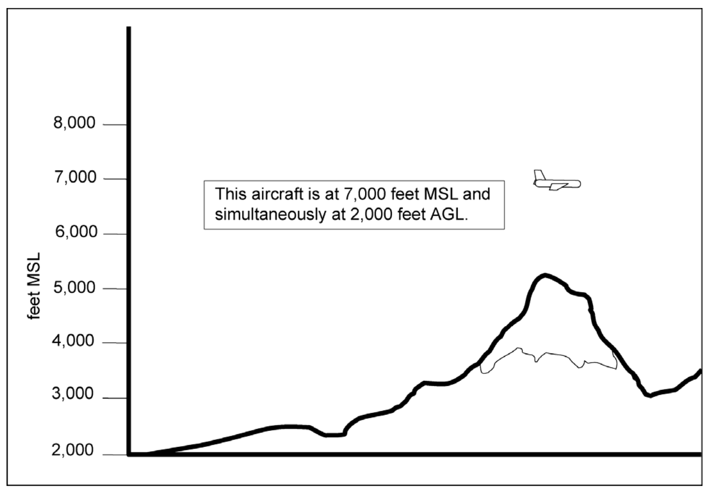


Figure 2.2-1. Types of Training Airspace

MTRs are flight corridors used to practice high-speed, low altitude training generally below 10,000 feet MSL. They are described by a centerline, with defined horizontal limits on either side of the centerline and vertical limits expressed as minimum and maximum altitudes along the flight track.

The F-22A spends more time training at higher altitudes than the F-15C or F-15E.

The F-22A would conduct numerous related training activities to fulfill its mission requirements. Table 2.2-1 describes the projected F-22A air superiority missions and training similar to those performed by the F-15C. F-22A training flights would closely match those performed by operational F-15C and F-15E aircraft in terms of nature and duration. Table 2.2-2 presents the training activities projected for F-22A similar to those performed by the F-15E. The F-22A would fly one and one-half to two hour long missions, including takeoff, transit to and from the training airspace, training activities, and landing. Depending upon the distance and type of training activity, the F-22A could spend between 20 to 60 minutes in a training airspace. On occasion during an exercise, the F-22A may spend up to 90 minutes in one or a set of airspace units. On average, the F-22A would fly the same percentage of time after dark (30 percent) as do the F-15C and F-15E currently using the airspace. Barring a national emergency or a large scale exercise, the after-dark sorties are not expected to occur during environmental night (10:00 p.m. to 7:00 a.m.).



The F-22A could use the full, authorized capabilities of the airspace units from 500 feet above ground level (AGL) to above 60,000 feet MSL. The F-22A would rarely (5 percent or less) fly below 5,000 feet AGL and consistently flies from 10,000 feet AGL to above 30,000 feet MSL (see Table 2.2-3.) Actual flight altitudes would depend upon the lower and upper limits of specific airspace units.

Table 2.2-1. Projected F-22A Training Activities Similar to F-15C Training

Activity	*Description*	*Airspace Type*	*Altitude (feet)*	*Time in Airspace*
Aircraft Handling Characteristics	Training for proficiency in use and exploitation of the aircraft's flight capabilities (consistent with operational and safety constraints) including, but not limited to high/maximum angle of attack maneuvering, energy management, minimum time turns, maximum/optimum acceleration and deceleration techniques, and confidence maneuvers.	MOA and ATCAA	5,000 AGL to 60,000 MSL	0.5 to 1.0 hour
Basic Fighter Maneuvers	Training designed to apply aircraft (1 versus 1) handling skills to gain proficiency in recognizing and solving range, closure, aspect, angle, and turning room problems in relation to another aircraft to either attain a position from which weapons may be launched, or defeat weapons employed by an adversary.	MOA and ATCAA	5,000 AGL to 30,000 MSL	0.5 to 1.0 hour
Air Combat Maneuvers	Training designed to achieve proficiency in formation (2 versus 1 or 2 versus 1+1) maneuvering and the coordinated application of Basic Fighter Maneuvers to achieve a simulated kill or effectively defend against one or more aircraft from a pre-planned starting position. Use of defensive countermeasures (chaff, flares). Air Combat Maneuvers may be accomplished from a visual formation or short-range to beyond visual range.	MOA and ATCAA	5,000 AGL to 60,000 MSL	0.5 to 1.0 hour
Low-Altitude Training	Aircraft offensive and defensive operations at low altitude, G-force awareness at low altitude, aircraft handling, turns, tactical formations, navigation, threat awareness, defensive response, defensive countermeasures (chaff/flares) use, low-to-high and high-to-low altitude intercepts, missile defense, combat air patrol against low/medium altitude adversaries.	MOA	500 AGL to 5,000 AGL	0.5 to 1.0 hour
Tactical Intercepts	Training (1 versus 1 up to 4 versus multiple adversaries) designed to achieve proficiency in formation tactics, radar employment, identification, weapons employment, defensive response, electronic countermeasures, and electronic counter countermeasures.	MOA and ATCAA	500 AGL to 60,000 MSL	0.5 to 1.0 hour
Night Operations	Aircraft intercepts (1 versus 1 up to 4 versus multiple adversaries) flown between the hours of sunset and sunrise, including tactical intercepts, weapons employment, offensive and defensive maneuvering, chaff/flare, and electronic countermeasures.	Warning Area, MOA, and ATCAA	2,000 AGL to 60,000 MSL	0.75 to 1.5 hour
(Dissimilar) Air Combat Tactics	Multi-aircraft and multi-adversary (2 versus multiple to larger force exercises) conducting offensive and defensive operations, combat air patrol, defense of airspace sector from composite force attack, intercept and simulate and destroy bomber aircraft, destroy/avoid adversary ground and air threats with simulated munitions and defensive countermeasures, strike-force rendezvous and protection.	MOA and ATCAA	500 AGL to 60,000 MSL	0.5 to 1.0 hour

MOA = Military Operations Area; ATCAA = Air Traffic Control Assigned Airspace; AGL = above ground level; MSL = mean sea level

Table 2.2-2. Projected F-22A Training Activities Similar to F-15E Training

Activity	*Description*	*Airspace Type*	*Altitude (feet)*	*Time in Airspace*
Navigation and Basic Surface Attack	Navigation on MTRs and air-to-ground simulated delivery of ordnance on a range.	MOA, Range	Surface to 18,000 MSL	0.5 to 1.0 hour
Tactical Weapons Delivery	More challenging multiple attack headings and profiles; pilot is exposed to varying visual cues, shadow patterns, and the overall configuration and appearance of the target. Supersonic speeds that can include target acquisition are added to the challenge.	ATCAA, MOA, Range	Surface to 60,000 MSL	0.5 to 1.0 hour
Surface Attack Tactics	Practiced in a block of airspace such as a MOA or Restricted Area that provides room to maneuver up to supersonic speeds. Defensive countermeasures may be deployed. Precise timing during the ingress to the target is practiced, as is target acquisition. Training includes egress from the target area and reforming into a tactical formation.	ATCAA, MOA, Range	Surface to 60,000 MSL	0.5 to 1.0 hour
LRSOW Delivery	Practiced in a MOA or ATCAA that provides for maneuvering room and supersonic speeds. Precise timing for speed, altitude, and launch parameters is practiced at high altitudes without release. Use of inert munitions in low altitude drops to evaluate timing and aircraft performance. Remote training using LRSOW at authorized ranges outside Alaska.	ATCAA, MOA, Range	Surface to 60,000 MSL	0.5 to 1.0 hour
Suppression of Enemy Air Defenses	Highly specialized mission requiring specific ordnance and avionics and can include supersonic speeds and defensive countermeasures. The objective of this mission is to simulate neutralizing or destroying ground-based anti-aircraft systems	ATCAA, MOA, Range	Surface to 60,000 MSL	0.5 to 1.0 hour
Large Force Exercises/Mission Employment	Multi-aircraft and multi-adversary composite strike force exercise (day or night), air refueling, strike-force rendezvous, conducting air-to-ground strikes, strike force defense and escort, air intercepts, electronic countermeasures, electronic counter-counter measures, combat air patrol, defense against composite force, bomber intercepts, destroy/disrupt/avoid adversary fighters, defensive countermeasure (chaff/flare) use.	MOA, MTR, ATCAA, and Range	Surface to 60,000 MSL	0.5 to 1.0 hour

MTR = Military Training Range; MOA = Military Operations Area; MSL = mean sea level; ATCAA = Air Traffic Control Assigned Airspace; LRSOW = Long Range Standoff Weapon

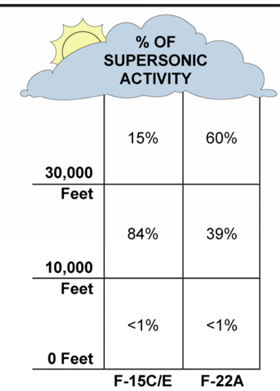
Table 2.2-3. Comparable F-15C and F-22A Altitude Use

Altitude (feet)	*Percent of Flight Hours: F-15C/E*	*Percent of Flight Hours: F-22A*
>30,000[1]	8%	30%
10,000-30,000	67%	50%
5,000-10,000	14%	15%
2,000-5,000	8%	3.75%
1,000-2,000	2.75%	1%
500-1000	0.25%	0.25%

Note: 1. Operations by F-22As would emphasize use of higher altitudes more often than F-15Cs.

The F-22A would employ supersonic flight to train with the full capabilities of the aircraft. All supersonic flight would occur at altitudes and within airspace already authorized for such activities. The F-22A would fly approximately 25 percent of the time spent in MOAs and ATCAAs at supersonic speed. In comparison, the F-15Cs or F-15Es commonly conduct supersonic flight for about 7.5 percent of the time. The F-22A would fly higher and at supersonic speeds more often than either the F-15C or F-15E. The F-22A has greater performance capabilities and pilots must train to use those capabilities.

The F-22A has superior performance capabilities to fly at supersonic speeds for several reasons. First, the F-22A can fly at supersonic speeds without the use of afterburners. This means that F-22A pilots could attain supersonic speeds in the course of normal maneuvering without employing a separate procedure (i.e., lighting the afterburner). Second, because of supercruise, the F-22A can fly at supersonic speeds with less expenditure of fuel. As such, pilots would be able to use the F-22A's supersonic capability more consistently with less concern for fuel use. Third, improved aerodynamics in the F-22A make it "cut through" the air easily and enables the F-22A to fly faster (i.e., supersonic) with less resistance. Finally, in terms of its mission, more frequent use of supersonic speeds would provide an advantage when engaging enemy aircraft or when simulating LRSOW use. Supersonic speed would enable the F-22A to "close on" (fly toward) its target and set up to fire a missile more rapidly than an aircraft with less supersonic capability. After "taking the shot," the F-22A could use its speed to evade adversary missiles and aircraft.



F-22A would conduct a higher percentage of their supersonic activity at higher altitudes than F-15Cs or F-15Es.

More than 99 percent of supersonic flight would be conducted above 10,000 feet MSL, with 60 percent occurring above 30,000 feet MSL. In authorized airspace, supersonic flight could infrequently occur below 10,000 feet MSL.

F-22A operational aircraft would fly training flights in one or more of the Alaskan SUA. Activities in the training airspace are termed *sortie-operations*. A *sortie-operation* is defined as the use of one airspace unit by one aircraft. Each time a single aircraft flies in a different airspace unit, one sortie-operation is counted for that unit. Thus, a single aircraft can generate several sortie-operations in the course of a mission.

The affected airspace units at Elmendorf AFB consist of primary MOAs used by the F-15Cs and F-15Es on a continuing basis for routine training and secondary MOAs used by the F-15Cs and F-15Es predominantly for major flying exercises. Figure 2.2-2 presents these primary and secondary airspaces. ATCAAs overlie all the primary MOAs and all but two secondary MOAs. These ATCAAs may extend up to or above 50,000 feet MSL. Figure 2.2-3 presents a closer view of Restricted Areas with the air-to-ground ranges identified.

2.2.1 F-22A Training Flights Within Alaskan Airspace

The F-22A has the potential to use missiles or a gun in air-to-air engagements. Training for the use of these weapons is predominantly simulated. Simulating air-to-air attacks uses all the radar and targeting systems available on the F-22A, but nothing is fired. F-22A live-fire training would occur during specialized training or exercises at ranges authorized for these activities.

The current sortie-operations in Elmendorf AFB MOAs within Alaska are presented in Table 2.2-4. The F-15Cs use the primary MOAs (Susitna, Stony A and B, Naknek 1 and 2, and Galena) for 85 percent of all their training sortie-operations and F-15Es use these MOAs for 30 percent of their training sortie-operations. Elmendorf AFB's F-15Cs and F-15Es dominate use of the primary MOAs. After the beddown, the F-15Cs would continue to use the MOAs for 85 percent of their training and the F-22As are projected to fly 63 percent of the sortie-operations in the primary MOAs. Table 2.2-4 compares existing training of F-15C and F-15E aircraft with the proposed training activity of Elmendorf AFB-based F-22A and F-15C aircraft.

Currently, the F-15C aircraft do not regularly train on MTRs. F-15E aircraft train on a limited number of Alaskan MTRs as presented in Table 2.2-5. MTRs that are not regularly used for F-15E training flights are not included in the table. The F-22A is expected to have a training requirement that would require pilots to fly on MTRs for point-to-point navigation at subsonic speeds (Table 2.2-5). Figure 2.2-4 depicts MTRs regularly used for F-15E training. F-22A training would include incidental training in the Blying Sound Warning Area (W-612) (see Figure 2.2-2). A Warning Area is an over water airspace similar to range airspace over land.

2.2.2 Air-to-Ground Training

The F-22A has an air-to-ground mission. Based on the Initial F-22A Operational Wing experience, F-22A pilots are projected to spend 80 percent of their training in air-to-air missions and 20 percent of their training in air-to-ground training. The Elmendorf AFB F-22A Operational Wing air-to-ground training would represent an important part of the F-22A training program, although air dominance mission training would continue as the priority. Projected air-to-ground training activities for this F-22A Operational Wing are presented in Table 2.2-2.

Most air-to-ground training would be simulated, where no munitions would be released from the aircraft. The F-22As use avionics to simulate ordnance delivery on a target. This type of training could be conducted in any of the airspace units and would not require an air-to-ground range.

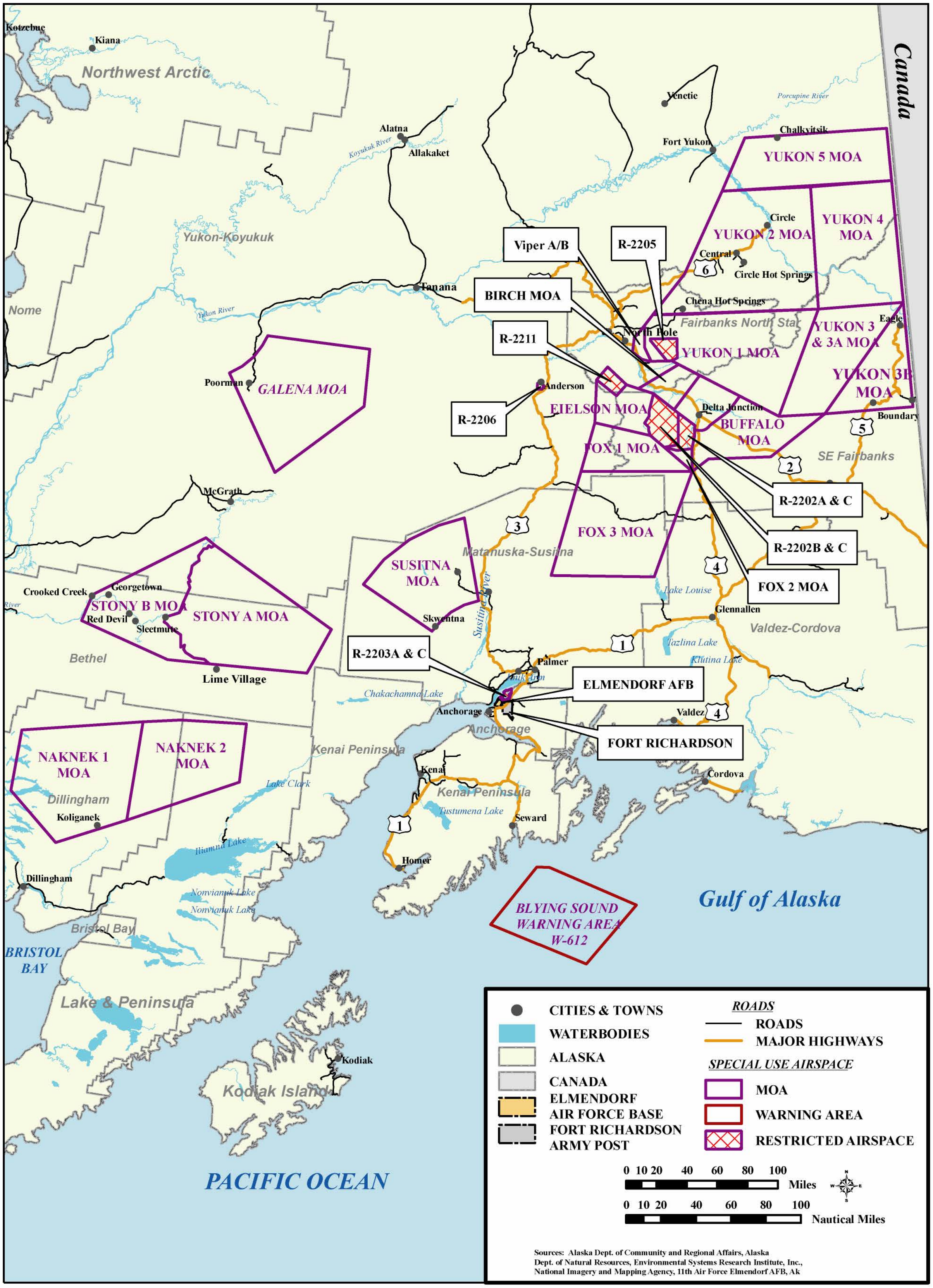


Figure 2.2-2. Training Special Use Airspace

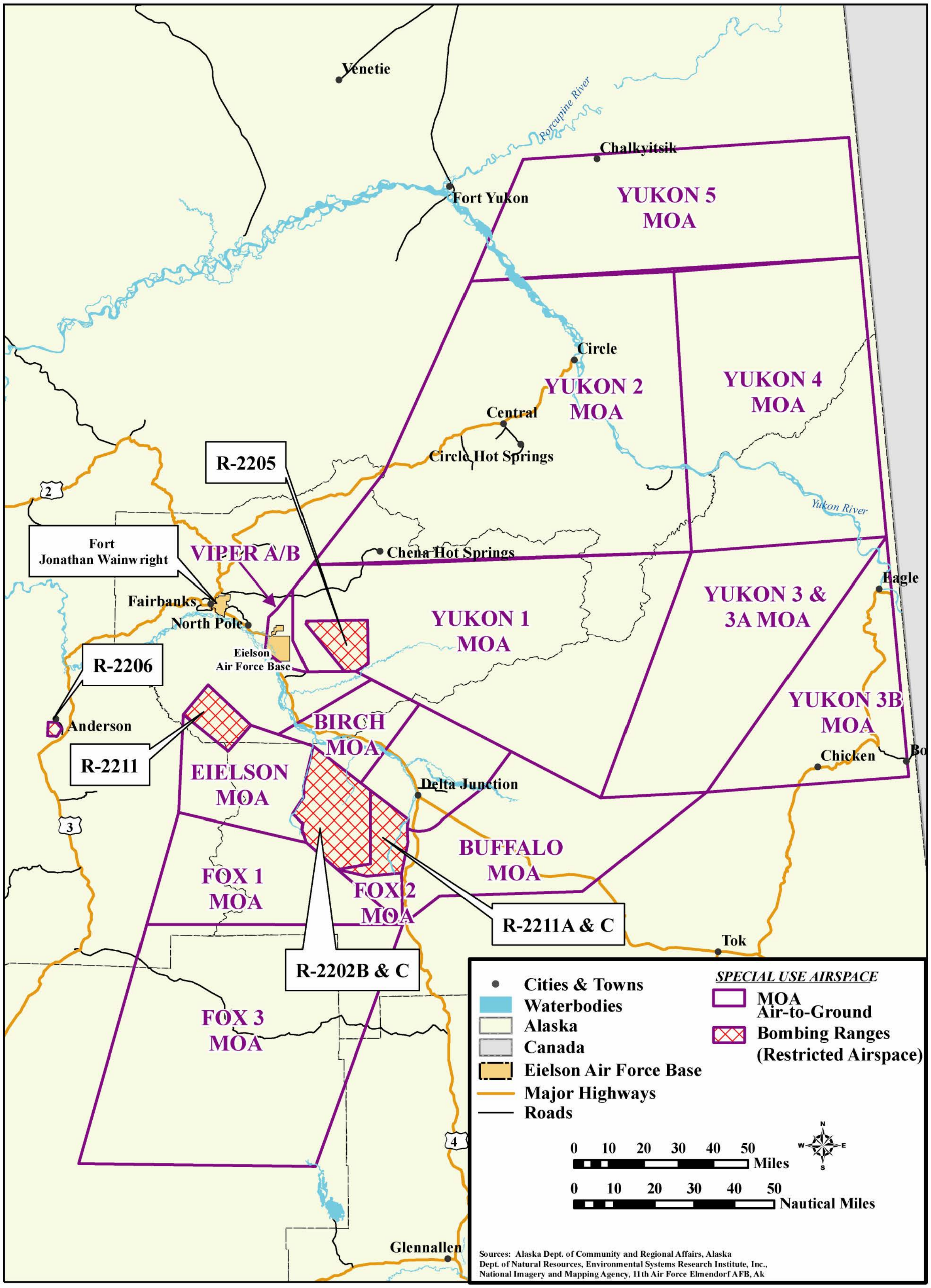


Figure 2.2-3. Restricted Areas and Air-to-Ground Ranges

Table 2.2-4. Baseline and Projected Annual Sortie-Operations in Regional MOAs

Airspace Unit	Floor (feet AGL)	Ceiling[1] (feet MSL)	Baseline Use				Projected Use			
			F-15C[2]	F-15E[3]	Other	Total	F-15C[4]	Other	F-22A[5]	Total
Primary Airspace										
Galena[6]	1,000	18,000	86	15	25	126	33	25	49	107
Naknek 1/2[7]	3,000	18,000	396	70	116	582	150	116	497	763
Stony A/B	100	18,000	3,380	599	986	4,965	1,270	986	1,646	3,902
Susitna	5,000 AGL or 10,000 MSL, whichever is higher	18,000	1,939	344	566	2,848	727	566	1,100	2,393
Secondary Airspace										
Birch	500	5,000	7	16	3,750	3,774	3	3,750	14	3,767
Buffalo	300	7,000	20	47	3,898	3,965	8	3,898	39	3,945
Eielson	100	18,000	81	185	6,029	6,295	30	6,029	153	6,212
Fox 1/2/3	5,000	18,000	294	672	5,351	6,317	110	5,351	555	6,016
Yukon 1	100	18,000	134	307	5,719	6,160	50	5,719	254	6,023
Yukon 2	100	18,000	106	244	4,907	5,257	40	4,907	201	5,148
Yukon 3 A/B[8]	100	18,000	199	454	2,947	3,600	75	2,947	375	3,397
Yukon 4	100	18,000	114	260	3,317	3,691	45	3,317	215	3,577
Yukon 5[9]	5,000	18,000	69	157	1,943	2,169	25	1,943	130	2,098
Viper	500	18,000	0	0	6,151	6,151	0	6,151	0	6,151

Notes:
1. ATCAA overlies all MOAs except Buffalo and Birch MOAs.
2. Numbers in this column are for 2 F-15C squadrons.
3. Numbers in this column are for 1 F-15E squadron.
4. Numbers in this column are for 1 F-15C squadron.
5. Numbers in this column are for 2 F-22A squadrons (36 aircraft).
6. Not used for MFE.
7. ATCAA up to 31,000 MSL.
8. Consists of Yukon 3A (100 AGL-10,000 MSL); Yukon 3B (2,000 AGL-18,000 MSL).
9. Used for MFE only.

AGL = above ground level; MSL = mean sea level; ATCAA = Air Traffic Control Assigned Airspace; MOA = Military Operations Area

Table 2.2-5. Existing F-15 and Proposed F-22A MTRs Used for Training

MTR	F-15E		F-22A	
	Existing	Proposed	Existing	Proposed
IR-900/IR-916	43	0	0	16
VR-1900/VR-1916	12	0	0	5
IR-919/IR-921	59	0	0	22
VR-937/VR-938	43	0	0	16
VR-935/VR-936	2	0	0	1

Sources: Air Force 2005a.
Department of Defense (DoD) 2004.

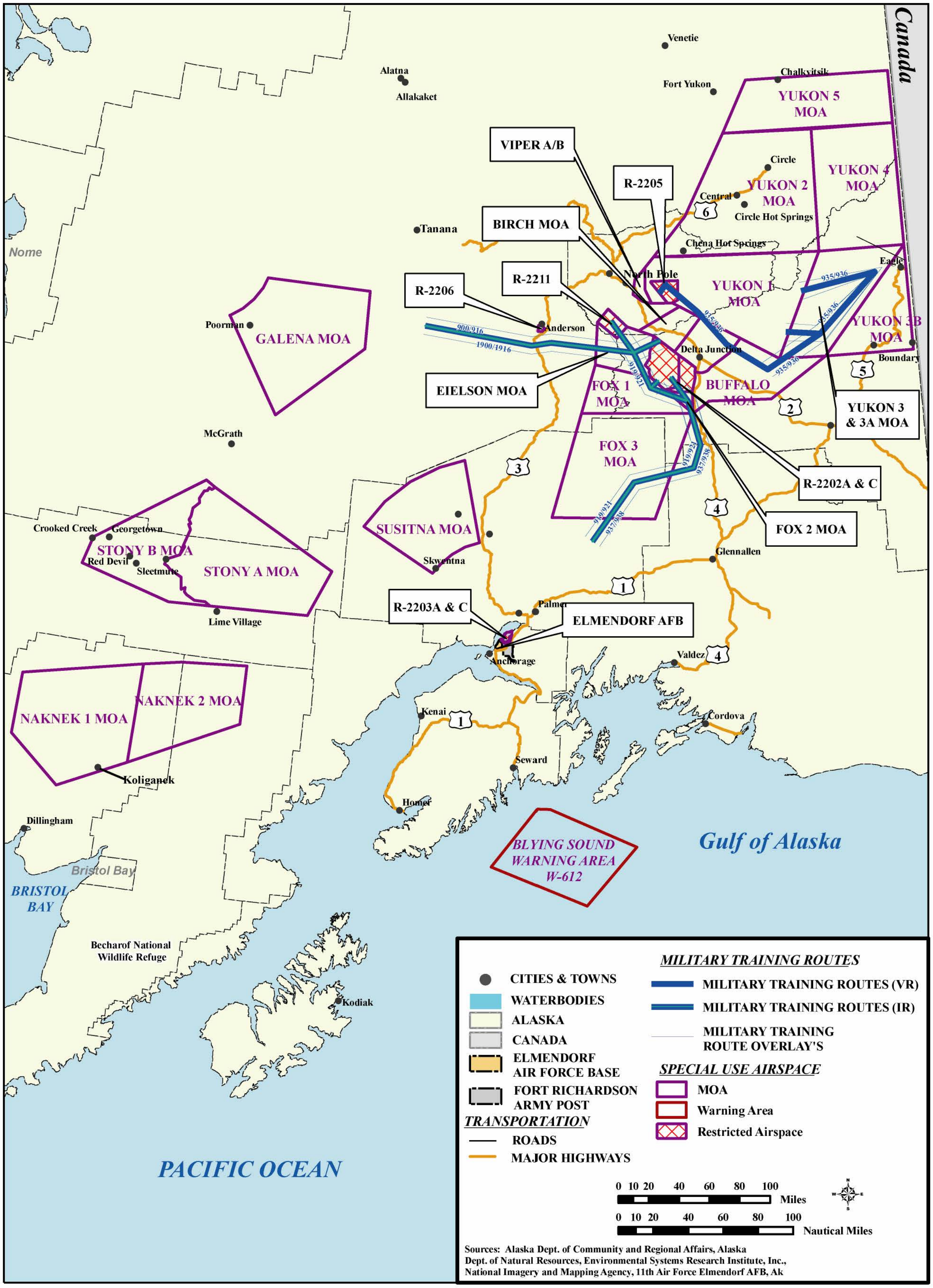


Figure 2.2-4. MTRs Proposed to be Used During F-22A Training

Air-to-ground training also includes ordnance delivery training. Ranges currently used for F-15E training offer limited target capabilities. All ordnance delivery training would adhere to the requirements and restrictions of the ranges. Table 2.2-6 presents the current F-15E air-to-ground munitions used in training and the projected F-22A training munitions. Although several different types of smaller munitions are being studied for the F-22A, the primary air-to-ground ordnance carried by the F-22A will be the Guided Bomb Unit (GBU)-32 and a Small Diameter Bomb (SDB) (GBU-39/B). The GBU-32 is a 1,000 pound equivalent variant of the Joint Direct Attack Munition (JDAM). JDAMs are guided to the target by an attached Global Positioning System receiver. SDBs are guided 250 pound equivalent munitions. Training with these weapons in Alaskan airspace could include accelerating to launch speed, altitude, and delivery profile prior to opening the weapons bay. No live JDAMs or SDBs would be released in Alaskan MOAs.

Table 2.2-6. Current and Projected Annual Air-to-Ground Munitions

Training Munition Class	*F-15E*	*F-22A*
25 pound	590	0
250 pound	0	200
500 pound	57	0
1,000 pound	0	50
2,000+ pound	30	0

In combat, these weapons could be released by an F-22A at supersonic speeds at altitudes up to 50,000 feet MSL. Actual ordnance delivery training at approved delivery profiles would occur during the times when F-22A squadrons would be deployed to other locations during special training cycles. Locations where levels of munition training is authorized could include the Nellis Range Complex in Nevada, the Utah Test and Training Range, and the approved ranges associated with Eglin AFB. An estimated 170 annual missions (approximately 3 percent of total F-22A missions) would be flown by the F-22As at exercises and training away from Elmendorf AFB. A portion of these missions would involve ordnance delivery training. The negligible level of use of these remote ranges and the current level of use by others suggest that projected F-22A use does not warrant additional detailed environmental analysis for these ranges.

F-22A training with munitions comparable in size to a JDAM or an SDB could occur on approved Alaskan Ranges. F-22A flight profiles, altitudes, and speed would be restricted to ensure that such munitions meet approved range weapon safety footprints.

2.2.3 Defensive Countermeasures

Chaff and flares are the principal defensive countermeasures dispensed by military aircraft to avoid detection or attack by enemy air defense systems. Although the F-22A's stealth features reduce its detectability, pilots must still train to employ defensive countermeasures. F-22As would use R-170 chaff and MJU-10/B flares in approved Alaskan airspace. Defensive chaff and flares are used to keep aircraft from being successfully targeted by weapons such as surface-to-air missiles, anti-aircraft artillery, or other aircraft. Appendix A describes the characteristics of chaff and Appendix B describes the characteristics of flares used in defensive training.

Effective use of chaff and flares in combat requires frequent training by aircrews to master the timing of deployment and the capabilities of the defensive countermeasure, and by ground

crews to ensure safe and efficient handling of chaff and flares. Defensive countermeasures deployment in Elmendorf AFB authorized airspace is governed by a series of regulations based on safety, environmental considerations, and defensive countermeasures limitations. These regulations establish procedures governing the use of chaff and flares over ranges, other government-owned and controlled lands, and nongovernment-owned or controlled areas. Chaff and flares would continue to be used in the primary and secondary MOAs.

A bundle of chaff consists of approximately 0.5 to 5.6 million fibers, each thinner than a human hair, that are cut to reflect radar signals and, when dispensed from aircraft, form an electronic "cloud" that breaks the radar signal and temporarily hides the maneuvering aircraft from radar detection. The chaff fibers are dispersed and four or five plastic or mylar pieces fall to the ground. Chaff use is limited to a total of 90,000 pounds annually over all the airspace (Air Force 1997). The F-22A is proposed to use less than 6 percent of that annual amount.

Flares ejected from aircraft provide high-temperature heat sources that mislead heat-sensitive or heat-seeking targeting systems. Flares burn for 3 to 4 seconds at a temperature in excess of 2,000 degrees Fahrenheit to simulate a jet exhaust. During the burn, a flare descends approximately 400 feet. The burning magnesium pellet is completely consumed and four or five plastic pieces and aluminum-coated mylar wrapping material falls to the ground. Restrictions for flare use in Alaskan MOAs are described below.

- Flares may only be deployed above 5,000 feet AGL from June 1 through September 30 to reduce the potential for fires.
- For the remainder of the year, the minimum altitude for flare use is 2,000 feet AGL, well above the safety standards set by the DoD.

As described in Section 1.3.1, the F-22A is still undergoing weapons test and evaluation. The actual amounts of chaff and numbers of flares deployed during training will be developed as F-22A tactics are refined. The defensive countermeasure numbers presented in this section are comparable to those anticipated for F-15C and F-15E non-stealth aircraft.

Table 2.2-7 presents the existing and proposed chaff use by air superiority aircraft. The 18 F-15C and 36 F-22A aircraft would be expected to use approximately the same amount of chaff as the 42 F-15C and 18 F-15E currently deploy in approved training airspace.

Table 2.2-7. Existing and Proposed Chaff Use (Annually in bundles of chaff)

Aircraft	*Existing*	*Proposed*	*Change*
F-15C	24,408	11,623	-12,785
F-15E	10,461	0	-10,461
F-22A	0	23,246	+23,246
Total	34,869	34,869	0

Table 2.2-8 summarizes the existing F-15C and F-15E and proposed F-22A flare use. The F-22A would release up to 14,916 flares per year in the MOAs. This level-of-use would result in the same number of flares used by the departing F-15C and F-15E squadrons. The number of flares used in each MOA would be proportional to the number of sortie-operations conducted by the F-22As. Based on the emphasis on flight at higher altitudes for the F-22A, approximately 80

percent of F-22A flare release throughout the approved MOAs would occur above 10,000 feet AGL.

Table 2.2-8. Existing and Proposed Flare Use (Annually in number of flares)

Aircraft	*Existing*	*Proposed*	*Change*
F-15C	14,919	7,104	-7,815
F-15E	6,394	0	-6,394
F-22A	0	14,209	+14,209
Total[1]	21,313	21,313	0

Note: 1. Includes 971 MJU-7 (T-1) flare simulators.

2.2.4 No Action Alternative Within the Alaskan Airspace

The No Action Alternative would not beddown two F-22A squadrons at Elmendorf AFB at this time. One F-15C squadron and one F-15E squadron have been identified as aircraft to be relocated as part of BRAC 2005. Eleventh Air Force mission requirements mean that No Action for the F-22A beddown could affect the schedule for BRAC action at Elmendorf AFB. No Action for this EA is equivalent to baseline use of SUA. Table 2.2-4, above, presents the airspace training associated with existing F-15C and F-15E squadrons. This airspace training would be expected to continue under No Action until the BRAC action was implemented.

2.3 Identification of Alternatives

The F-22A, F-22, and F/A-22 are different designations that have been used for the same aircraft.

This section tiers from the alternative location identification process contained in the Initial F-22 (F-22A) Operational Wing Beddown Final Environmental Impact Statement (EIS) (Air Force 2001a). The process for identifying alternative bases for the Initial F-22A Operational Wing beddown considered operational requirements, environmental considerations, and input from public scoping. Although the F-22A program considered in the EIS had air superiority as its primary mission, the EIS also notes the air-to-ground missions, identifies air-to-ground munitions carried by the aircraft, and describes training with those munitions (Final EIS Section 2.1.2). The information in the Final EIS about F-22A air-to-ground missions was the best available at the time of the EIS.

Subsequent to the Initial F-22 Operational Wing Beddown Final EIS, there has been improved understanding of the combined air-to-air and air-to-ground missions of the F-22A. This improved understanding continues to emphasize all aspects of air superiority (including both air-to-air and air-to-ground missions) and does not change the Operational Wing beddown criteria used in the EIS for identifying bases appropriately analyzed for an Operational Wing of the F-22A. Those criteria are summarized in Table 2.3-1.

Table 2.3-1. Summary of Selection Criteria to Beddown an F-22A Operational Wing

Criteria	*Explanation*
1. Air Force Base with an Existing F-15C Mission	The F-22A Operational Wing must be established at an Air Force base to maintain positive command and control and to ensure mission priority. Beddown of the F-22A at an F-15C base would result in the least disruption in operations and combat capability. In addition, the organizational structure, training regimes, mission planning capabilities, and support functions (e.g., weapons handling, security) at an F-15C base would already match those needed for an F-22A Operational Wing.
2. Established Support for Fighter Aircraft	An operational fighter wing needs a base already conformed and organized to support fighter aircraft. Requirements (e.g., infrastructure, organization) for fighter aircraft differ markedly from those for bombers, tankers, and transports. Fighter aircraft commonly generate more sorties, but have shorter duration missions. Maintenance and support crew organization and logistics must fit the tempo and nature of fighter operations.
3. Access to Airspace for Training	The base must have access to existing airspace of sufficient size and vertical dimensions to accommodate the breadth of training required for the air superiority mission, including multi-aircraft, air-to-air combat engagements, and supersonic flight. The airspace must be located within sufficient proximity to the base to support unrefueled F-22A training.
4. Support Varied Training Opportunities	Varied training must provide aircrews with the opportunity to encounter the wide range of situations that mirror combat as closely as possible. Such training requires the F-22A pilots to face and defeat threats from the air and the ground. Realism and quality in such situations involve a range of training activities including multi-aircraft engagements, identifying and targeting adversaries from long distances, and using the full capabilities of the F-22A. For defeating both air and ground threats, the ability to use chaff and flares as defensive countermeasures forms an important quality of the airspace.
5. Available Infrastructure	To maximize the efficiency of the F-22A beddown and to offer the ability to integrate the F-22A mission immediately, the base must provide adequate infrastructure. The existing infrastructure (e.g., fueling, runways) of a base must be designed and oriented around a fighter mission.
6. Existing Communications Links	Any base considered suitable for the beddown must have the existing communication capability to accommodate the requirements of an air dominance wing.

Source: Air Force 2001a.

2.3.1 Review of Candidate Basing Locations

Forty-three Air Force bases were screened to six alternative bases in the Initial F-22 Operational Wing Beddown Final EIS. These six bases were considered candidate bases for the F-22A Second Operational Wing beddown. The current status of the six bases as potential alternatives for beddown of the Second Operational Wing of F-22A aircraft is reviewed below:

1. ***Langley AFB.*** Selected as the location for the Initial F-22A Operational Wing. Selected through BRAC 2005 to retain F-15C aircraft. Not a candidate location for the F-22A Second Operational Wing at this time.
2. ***Eglin AFB.*** Selected through BRAC 2005 as the location for all F-35 training by Air Force, Marine, and Navy pilots. Not a candidate location for the F-22A Second Operational Wing at this time.
3. ***Elmendorf AFB.*** Identified in BRAC 2005 as a base to lose one squadron of F-15C air superiority aircraft and one squadron of F-15E combined air-to-air and air-to-ground aircraft. The BRAC actions would create a mission void and concurrently create unused fighter beddown capacity at a location which meets all six beddown criteria. Continues to be a candidate for F-22A Second Operational Wing.
4. ***Mountain Home AFB.*** Identified in BRAC as the location for efficiently concentrating F-15E operational aircraft, including Elmendorf AFB F-15E aircraft. Beddown of F-15E aircraft will require construction and other changes at base over the next several years. Not a candidate for F-22A Second Operational Wing at this time.
5. ***Nellis AFB.*** An F-22A Force Development and Evaluation (FDE) squadron has been beddown and two squadrons of F-35 are scheduled to be beddown at Nellis AFB to support the Air Warfare Center, Air Force Weapons School, and other training, testing, and evaluation units. The unique functions served by Nellis AFB limit the ability to accommodate all facilities and operational requirements associated with the F-22A Second Operational Wing at this time.
6. ***Tyndall AFB.*** All F-22A advanced pilot training will be located at Tyndall AFB. The concentration of all F-22A advanced training aircraft with the F-22A Second Operational Wing would place all operational F-22A assets east of the Mississippi River and a substantial number of F-22A aircraft along the Gulf Coast. It would be operationally superior to not concentrate assets at this time and to have the F-22A second wing closer to the Pacific theater.

Elmendorf AFB is the only base which meets the original selection criteria for an Operational Wing beddown (Table 2.3-1), meets national needs for location, and has the capacity at this time to accommodate the Second F-22A Operational Wing. Elmendorf AFB is uniquely positioned to support the missions of the F-22A because, until the BRAC decision, Elmendorf AFB had both the Air Force air-superiority F-15C and air-to-ground F-15E missions. The F-22A would draw from that experience for its air-superiority role that includes both air-to-air and air-to-ground responsibilities. Elmendorf AFB command and control, other infrastructure and administrative capabilities, and training airspace are suited to the combined F-22A air superiority and air-to-ground capabilities.

2.3.2 Alternatives Carried Forward: Facility Locations on Elmendorf AFB

Operational pilots must continually train to maintain skills essential for combat. Existing Alaskan airspace would meet the training needs of F-22A pilots based at Elmendorf AFB.

The three beddown options described in Sections 2.1.1 through 2.1.3 represent alternative configurations for bedding down the F-22A Wing at Elmendorf AFB. Each different facility has cost and command and control aspects. These three options have been identified as best able to meet the F-22A operational requirements without disrupting other operations at Elmendorf AFB. Option B combines efficiencies of facility construction and wing operation to make it the Air Force's preferred alternative.

2.3.3 Alternatives Considered But Not Carried Forward

Thirty-five of 41 active Air Force bases (after BRAC 2005) do not have an operational air superiority (F-15C) squadron. Of the six remaining bases, Eglin AFB, Langley AFB, Mountain Home AFB, and Nellis AFB have been designated through BRAC or other Air Force planning to receive substantial additional Air Force assets in the immediate future (refer to Section 2.3.1). Therefore, they do not have the capacity to beddown an F-22A Operational Wing at this time. The fifth remaining base, Tyndall AFB, is not located with quick access to the Pacific Rim and would concentrate nearly one-half of the near-term advanced training and operational F-22A aircraft in one location. Therefore, placing the Second F-22A Operational Wing at Tyndall does not meet the current needs of the Air Force. The F-22A Second Operational Wing beddown would better serve national interests if it were located proximate to the Pacific Rim.

None of the above listed five bases was carried forward for consideration as the beddown location for the second F-22A Operational Wing.

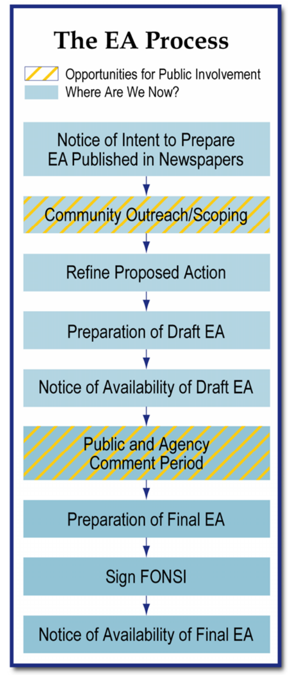
One base, Elmendorf AFB, will have one existing F-15C squadron (after BRAC) and immediate recent experience with both F-15C air-superiority and F-15E air-to-ground operational squadrons. Elmendorf AFB is carried forward as the proposed location for the Second F-22A Operational Wing.

2.4 Environmental Impact Analysis Process

This EA for the Second F-22A Operational Wing beddown at Elmendorf AFB has been prepared in accordance with NEPA (42 United States Code [USC] 4321-4347), CEQ Regulations (40 CFR § 1500-1508), and 32 CFR 989, *et seq.*, *Environmental Impact Analysis Process* (Air Force Instruction [AFI] 32-7061). NEPA is the basic national requirement for identifying environmental consequences of federal decisions. NEPA ensures that environmental information is available to the public, agencies, and the decision-maker before decisions are made and before actions are taken.

2.4.1 Environmental Assessment Process

The environmental analysis process, in compliance with NEPA guidance, includes public and agency review of information pertinent to the Proposed Action including three beddown options, and provides a full and fair discussion of potential consequences to the natural and human environment. Community outreach/scoping meetings were conducted in Fairbanks, Alaska, from 20 through 22 October 2005 and in Anchorage, Alaska on 24 October 2005 to involve the public and agencies, to identify possible consequences of an action, and to focus analysis on environmental resources potentially affected by the Proposed Action or the No Action Alternative. Interagency and Intergovernmental Coordination for Environmental Planning letters were sent and responses received through January 2006. Community outreach and scoping handouts and Interagency and Intergovernmental Coordination for Environmental Planning (IICEP) letters provided by the Air Force in late 2005 and early 2006 included information on 48 PAI as the Proposed Action. Since that time, the number of aircraft has been modified to 36 PAI.



F-22A Beddown EA

2.4.2 EA Organization

This EA is organized into the following chapters and appendices. Chapter 1.0 describes the purpose and need of the proposal to beddown the F-22A at Elmendorf AFB. A detailed description of the Proposed Action analyzing three beddown options and the No Action Alternative is provided in Chapter 2.0. Finally, Chapter 2.0 provides a comparative summary of the effects of the Proposed Action options and No Action Alternative with respect to the various environmental resources.

Chapter 3.0 describes both the existing conditions and potential consequences of the three facility locations options and the No Action Alternative at Elmendorf AFB. Chapter 4.0 describes the existing conditions and environmental consequences and the No Action Alternative within the proposed training SUA. A full range of applicable environmental resources is presented. Chapter 5.0 presents a cumulative analysis, considers the relationship between short-term uses and long-term productivity identified for the resources affected, and summarizes the irreversible and irretrievable commitment of resources if the Proposed Action were implemented. Chapter 6.0 contains references cited in the EA and lists

the individuals and organizations contacted during the preparation of the EA. A list of the document preparers is included in Chapter 7.0.

In addition to the main text, the following appendices are included in this document: Appendix A, Characteristics of Chaff; Appendix B, Characteristics and Analysis of Flares; Appendix C, Agency Coordination; Appendix D, Aircraft Noise Analysis and Airspace Operations; Appendix E, Review of Effects of Aircraft Noise, Chaff, and Flares on Biological Resources.

2.4.3 Scope of Resource Analysis

The Proposed Action including three options have the potential to affect certain environmental resources. These potentially affected resources have been identified through public scoping meetings, communications with state and federal agencies and Alaska Natives, and review of past environmental documentation. Specific environmental resources with the potential for environmental consequences include airspace management and air traffic control (including airport traffic), noise, safety, air quality, physical resources, biological resources, cultural resources, land use (including recreation and transportation), socioeconomics, and environmental justice.

2.4.4 Public and Agency Input

The Air Force initiated early public and agency involvement in the environmental analysis of the proposed beddown of the F-22A. The Air Force published newspaper advertisements, posted flyers, sent out press releases, and distributed Intergovernmental Coordination for Environmental Planning letters. These announcements solicited public and agency input on the proposal and invited the public and agencies to attend community outreach scoping meetings on the F-22A Beddown in Fairbanks and Anchorage, Alaska, October 20-22 and October 24, 2005, respectively. Table 2.4-1 presents details on the community outreach events.

Table 2.4-1. Community Outreach Scoping Meetings

Publication	*Meeting Date*	*Meeting Location*
Fairbanks Daily News-Miner, October 8, 2005	October 20 to 22, 2005 Daily 8:00 a.m. to 5:00 p.m.	F-22A booth at the Alaska Federation of Natives Conference, Carlson Center, 2010 2nd Avenue, Fairbanks, AK
Anchorage Daily News, October 9 and Sourdough Sentinel, October 14, 2005	October 24, 2005 4:00 to 7:00 p.m.	Public meeting at the Hilton Garden Inn Anchorage, 100 W. Tudor Road, Anchorage, AK

Table 2.4-2 presents issues identified by the public, Alaska Natives, and government entities during scoping for this EA. Table 2.4-3 summarizes public and Alaska Native comments received during the 30-day public and agency comment period. Column two provides a summary of the comment and column three provides the reader a reference to the page number and section in the EA where the response may be found.

Table 2.4-2. Summary of Public Comments and Notes from Scoping/Community Outreach Events (Page 1 of 3)

Fairbanks, Alaska: **Thursday, 20 October 2005**
1. Potential conflict with private aircraft using the same airspace in Naknek MOA. (See Sections 4.1 and 4.9) 2. Aircraft noise during recreational canoe trip in the Yukon Flats area. (See Section 4.2) 3. Is it possible to schedule flights to avoid high recreational use, such as weekends and holidays? (See Sections 4.8 and 4.9) 4. Is it possible to schedule flights to avoid hunting seasons? Training noise could affect caribou or other game. (See Section 4.6) 5. There are occasions where barges are not able to access the villages. Villagers must rely on subsistence hunting that occurs during the summer. (See Section 4.23) 6. What would be the effects of the A-10 or F-16 leaving on the Fairbanks economy? What would be the economic effects of cutting back Eielson AFB? Response: BRAC actions are independent of an F-22A beddown decision. 7. During hunting season, when hunters are flown in, there is a potential conflict with pilots in the air in Naknek MOA. (See Sections 4.2 and 4.8) 8. Participant enjoyed viewing fighter aircraft in the Stony airspace during hunting season. (See Section 4.1) 9. Why does the Air Force need to fly and train in the designated MOAs? (See Section 2.2) 10. What happens if an engine catches fire and stops operating? (See Sections 3.3 and 4.3) 11. How much time do the aircraft train at different altitudes? Do the noise levels change? (See Sections 2.2 and 4.2) 12. Does the Air Force use missiles during air-to-air training? (See Section 2.2) 13. How will noise affect hunting in Naknek and Stony MOAs? (See Section 4.7) 14. Will there be flare use? If so, how much? (See Section 2.2.3) 15. The map shows a road to Cordova, but the road does not go to Cordova. It does not go further than Chitina. (See Section 2.2.1) 16. Participant heard sonic booms on his trap line outside of Galena. He was not bothered by the noise, but in one instance, a friend was startled while he was skinning a moose and heard a sonic boom. (See Sections 4.2 and 4.7) 17. Some individuals west of the Eielson MOAs mentioned observing overflights (probably from aircraft on MTRs). Response: F-22A training aircraft will use MTRs less than the current F-15E use. 18. Will Galena or King Salmon remote airfields continue to be utilized by the Air Force? Response: Decisions on the use of these remote airfields is independent from an F-22A decision. 19. Will there be supersonic flight over migrating caribou or during calving season? How will overflights affect the Naknek MOA? (See Sections 4.2 and 4.6)

Table 2.4-2. Summary of Public Comments and Notes from Scoping/Community Outreach Events (Page 2 of 3)

20. Will the Air Force be visiting specific villages. Response: Scoping provided access to persons from throughout the state. Separate letters have been sent to villages to request information. 21. What will happen to the Kulis Air Guard C-130s? Response: The F-22A decision is independent from a decision regarding Guard aircraft. For the purpose of this EA, moving the C-130s to Elmendorf is included in the noise, air quality, and cumulative analysis. 22. The village of Chitina, a high concentration of people along the river, was not shown on the handout map. (See Section 4.7.2)
Fairbanks, Alaska: **Friday, 21 October 2005**
1. A resident from near Central hears jets, but not sonic booms. Will there be more noise? (See Section 4.2) 2. A hunter believes the animals get used to the noise and adapt to it. (See Sections 3.6 and 4.6) 3. People outside the airspace occasionally see a military aircraft fly by in both inland and coastal areas. Response: Military aircraft in transit, training on MTRs and supporting homeland security exercises could result in flights outside of special use airspace. 4. Some individuals did not see their villages on the map, but could approximate where they lived. (See Section 4.7.2) 5. People from the urban areas of Anchorage and Fairbanks heard noise from military aircraft using the base runways. (See Section 3.2)
Fairbanks, Alaska: **Saturday, 22 October 2005**
1. What is the number of military aircraft in Alaska now, and how will that change? Response: Air Force, Army, and other agencies have fixed and rotary wing aircraft based throughout Alaska. Mission changes and other decisions, such as BRAC, affect the number of military aircraft in Alaska at any given time. 2. Will the number of aircraft flying in the airspace increase or decrease? (See Section 2.2) 3. Are there going to be aircraft flying over recreational areas? If the Air Force agreed to avoid those areas, they should avoid them. (See Section 2.2) 4. Lack of access due to the missile defense system facilities and missile launch requirements off of Kodiak Island limit access to the coastal villages. Response: The F-22A is not proposed to be involved in the missile defense system. 5. Military aircraft often fly in areas outside the MOAs when they are not training. Response: Military aircraft in transit, training on MTRs and supporting homeland security exercises could result in flights outside of special use airspace. 6. Several commentors noted their experience with an F-15 crash near Galena. (See Section 4.3) 7. An individual who lives in Fox, near Fairbanks, does not hear noise from jets very often. (See Section 4.2)

Table 2.4-2. Summary of Public Comments and Notes from Scoping/Community Outreach Events (Page 3 of 3)

8. One individual noted an airspace conflict between one military aircraft and a spotter aircraft utilized to track herring fisheries. Response: F-22A use of off-shore Warning Areas would be negligible.
Anchorage, Alaska: **Monday, 24 October 2005**
1. An individual inquired where construction at Elmendorf AFB would be occurring and what the proposal entailed. (See Section 2.1) 2. An attendee expressed appreciation for the open and attentive community outreach event. (See Section 2.4)

Table 2.4-3. Elmendorf F-22A Beddown Draft EA Public Comments (Page 1 of 7)

Resource	*Summarized Comment*	*EA Section and Response to Comments*
Preferred Alternative	We concur that Option B appears to be the most appropriate construction plan when considering cost, environmental and socio-economic impacts, and facility requirements.	Appreciate the comment. Option B is the Air Force's preferred alternative.
General	The graphic lists some 3 WG flying squadron patches. To be accurate, I believe the wing still has two other flying squadrons.	***Refer to Chapter 1.0***, page 1-10. ***Response:*** Additional squadron patches were added.
Description of Proposed Action and Alternatives	ATCAAs are not charted by the FAA and are managed by letter of agreement with the ATC controlling facility. They are above 18,000 feet MSL and are generally not associated in NEPA environmental analysis because all (military and civilian) subsonic aviation activity above 18,000 feet MSL is regarded as having minimal effect on the environment (especially not "significant" which would require an EIS).	***See Section 2.2***, page 2-15. ***Response:*** NEPA is required for the beddown of the F-22A which includes training airspace.
Airspace	You make repeated references to "effects" on general aviation as if they are "environmental." This would be true if you listed them with economic impact, by placing a "burden on the public," for example, by restricting IFR traffic from access to MOAs. I believe the impact you are implying is on "aviation safety" and should be discussed in that section.	***Response:*** Airspace used by general aviation has been defined as an environmental resource by the courts.
Airspace	MOAs are charted by the FAA and scheduled use and real time use can be obtained from the scheduling agency, any regional FAA Flight Service Station, or the ATC controlling facility.	***See Section 2.2***, page 2-15.
Airspace	Training while operating under VFR does not afford Air Force crews any special rights or privileges above what is required by any other pilot flying in the National Airspace System; they must comply with VFR just like every other pilot.	***EA Text Change:*** Page 4-1, Section 4.1.1. Inserted at end of second paragraph: Elmendorf aircrews fly under FAA rules when not training in SUA.
Airspace	The training airspace in Alaska is managed "regionally" by the 11th Air Force Commander.	***See Section 2.2***, page 2-15. ***EA Text Change:*** Page 4-2, Section 4.1.2, second new sentence reads: Alaskan SUA is managed by the 11th Air Force Commander.
Airspace	Commentor suggested that in Table 4.1-1 the hours published are those normally scheduled. The hours of use for almost all the airspace listed implies that training is not accomplished outside those times. FAA Order 7400.8 allows for most of them to be from 0700L to 2200L. No information source is listed at the bottom like that listed for Table 4.1-2.	***EA Text Change:*** Page 4-3, Section, 4.1.2.2, Table 4.1-1, Note 1, second sentence to read: All times are local times as normally scheduled. Added Source: FAA 2000.

Table 2.4-3. Elmendorf F-22A Beddown Draft EA Public Comments (Page 2 of 7)

Resource	*Summarized Comment*	*EA Section and Response to Comments*
Airspace	A commentor suggested that in Section 4.1.2.3 it should be added that MTR schedules are given to local Flight Service Stations and that pilots can get scheduling information from them.	***EA Text Change:*** Page 4-4, Section 4.1.2.3, first paragraph to end with sentence: No changes to MTRs are proposed as part of the F-22A beddown.
Airspace	One commentor had several comments related to the Restricted Airspace in Section 4.1.2.4 and suggested that the document mention that R-2202, R-2205, and R-2203 are owned and managed by the Army and used by the Air Force; only R-2211 is Air Force-owned and managed; no one flies in R-2206; and according to FAA Order 7400.8M "C" is between 10,000 and 3 1,000 and D is above 31,000.	***EA Text Change:*** Page 4-4, Section 4.1.2.4, second to last sentence to read: The restricted airspaces, R-2202, R-2203, and R-2205, are Army ranges used by the Air Force for training. R-2206 is not a flying range. R-2211 is Air Force-owned and managed airspace to support training activities. R-2202C is between 10,000 and 29,000 feet MSL and R-2202D is 31,000 feet MSL to unlimited.
Airspace	An individual inquired about the hours of operation included in Table 4.1-2.	***EA Text Change:*** Page 4-5, Section 4.1.2.3, Table 4.1-2, Note 2, second sentence to read: All times are local times as normally scheduled.
Airspace	Commentor suggested not including Restricted Airspace R-2206 because it is used for flight safety rather than aircraft training.	***EA Text Change:*** Page 4-6, Section 4.1.2.4, Table 4.1-3: Note 3 (next to R-2206) replaced with Note 4. Not used for aircraft training.
Airspace	In Section 4.1.3.1, what does impact on airspace management have to do with environmental consequences?	***EA Text Change:*** Page 4-6, Section 4.1.3.1, third paragraph. Change last sentence to read: With regard to airspace management, the Proposed Action would not require any changes to how the airspace is currently managed. The mitigation measures in the 1995 MOA EIS ROD continue to apply (Air Force 1995).
Noise	Mention the Human Use Study.	***EA Text Change:*** Page 4-7, Section 4.1.3.1, add to end of paragraph before Alaska Native Concerns. A series of studies were conducted as part of the MOA EIS. Dissemination of information was found to be an important element in explaining airspace management and use. For example, information boards along the Chena River in the state recreation area explain military aircraft training use of the overlying airspace.
Airspace, Safety	The mission of any pilot is to accomplish the mission but conduct each flight safely. Each flight comes with inherent risks. The Air Force mission has more risk due to the nature of the aircraft and mission being flown. Suggest rewording see and avoid procedures in Alaska Native Concern paragraphs.	***EA Text Change:*** Page 4-7, Section 4.1.3.1, Alaska Native Concerns. Last two sentences to read: These FAA rules require that all pilots are equally responsible to apply "see and avoid" techniques when operating an aircraft. As noted during scoping meetings, enhanced F-22A electronics and situational awareness are projected to reduce risks of conflicts with general aviation.

Table 2.4-3. Elmendorf F-22A Beddown Draft EA Public Comments (Page 3 of 7)

Resource	*Summarized Comment*	*EA Section and Response to Comments*
Airspace	A commentor referred to Section 4.1.3.1, second paragraph, last sentence and stated, "I disagree, I believe that reduction in Air Force training (which is not separated from General Aviation) will benefit General Aviation and everyone involved as it relates to Aviation Safety. If the MTR use rate is cut by 50%, the risk of a mid-air mishap is cut by 50%. Since this relates to MTR activity, the FAA does not remove MTRs from public access. So the *benefit* as you say is significant, as the mishap potential is cut by 50%".	***Response:*** Reduced use recognized as a benefit in EA.
Noise	Supersonic operations are not allowed in Birch, Buffalo, Yukon 3A Low, and Naknek MOAs.	***See Section 4.2.2.2***, page 4-10. Columns specify "MOA/ATCAA"
Safety	Mention existing programs and guidance the Air Force uses to mitigate the mid-air potential risks.	***EA Text Change:*** Page 4-14, Section 4.3.1, second sentence to read: Elmendorf AFB has existing programs and guidance to support safe operations and reduce risks associated with training in Alaskan airspace (Air Force 1995; Elmendorf AFB 2003; 3rd Wing [3 WG] 2004).
Safety	A commentor suggested that the MOA mishap rate logic used in the EA may be faulty. The commentor goes on…assuming that Air Force mishap rates are smooth for the different phases of flight. In other words, your logic is OK if an equal amount of mishaps occur while training as they do during takeoff, enroute and returning from the airspace or during landing. I am guessing that your prediction is low – that more mishaps occur during takeoff and landing and not so many during actual training.	***See Section 4.3.2.1***, Page 4-15, first paragraph. This notes that mishaps occur more frequently around airfields. The analysis is representative of the level included in environmental documents.
Safety	Your discussion of the Air Force's mitigation of mid-air collision potential (during hunting season) is incomplete. I submit that you need to factor in the mid-air collision potential with general aviation aircraft, and since they will reduce Air Force exposure due to F-15E removal, the overall safety picture will be better as the risk of mid-air potential will be reduced. Also note W-612.	***EA Text Changes:*** Page 4-15, Section 4.3.2.1, new fourth paragraph to read: As noted in Section 2.2.2.1, MTR use by F-22A aircraft is projected to be less than 40 percent of existing F-15E usage. This lower use could minimally reduce any risks of low altitude accidents. Page 4-16, Table 4.3-1, Note 1 to read: W-612 is an offshore warning area not included in the mishap analysis because it is not scheduled for regular F-22A training.

Table 2.4-3. Elmendorf F-22A Beddown Draft EA Public Comments (Page 4 of 7)

Resource	*Summarized Comment*	*EA Section and Response to Comments*
Physical Resources/ Biological Resources	Suggest inclusion of W-612 and the MTRs throughout EA.	***EA Text Change:*** Page 4-25, Section 4.5.2, last paragraph after "…Dillingham (Air Force 1995)": The offshore warning area W-612 is presented on Figure 1.1-2. W-612 is not scheduled for normal F-22A training. MTRs presented in Figure 2.2-4 are expected to be used by F-22A aircraft less than 40 percent of the time they are currently used by F-15E aircraft. Physical Resources under these MTRs are comparable to those under nearby MOAs. ***EA Text Change:*** Page 4-26, Section 4.6.2, first sentence to read: Existing training airspace used by Elmendorf AFB occurs primarily in MOAs and ATCAAs which overlie approximately 38.5 million acres. New last sentence added to same paragraph to read: W-612 is not planned for substantial F-22A training and MTR training would be reduced to 40 percent of current use. For these reasons, the focus of this analysis is the SUA proposed for F-22A training.
Biological Resources	Is "Special Status" a biological term used by biologists? Who determines what species receive this designation?	***EA Text Change:*** Page 4-26, Section 4.6.2, first sentence under Special-Status Species to read: Special-Status Species include species designated as threatened, endangered, or candidate species by state or federal agencies.
Biological Resources	A commentor suggested that in Section 4.6.3 Harrington and Veitch were critiqued for not necessarily being able to conclude that actual low flights were really anywhere near caribou. The commentor went on to add, their old study should not be referenced when we have much more recent data relating specifically to actual animals located within this airspace (not Eastern Canada).	***EA Text Change:*** Page 4-28, Section 4.6.3, last sentence in third paragraph, add after "Labrador": Eastern Canada, where military training flights occur over 100 feet AGL. Over 98 percent of F-22A training flights would be above 2,000 feet (See Section 2.2).
Biological Resources	How was the conclusion made in Section 4.6.3 that animals are "likely habituated?"	***EA Text Change:*** Page 4-29, Section 4.6.3, first paragraph, add reference to end of paragraph: (Refer to Appendix E.)
Cultural Resources	A commentor pointed out that prior to Figure 4.7-1, the EA did not mention the Native Corporations anywhere in the preceding text (existing conditions). The commentor suggested that the mention of them in this figure implied that they are given some type of status similar to Federally Recognized Tribes.	***EA Text Change:*** Page 4-33, Section 4.7.3, Traditional Cultural Properties and Alaska Natives Concerns Subsection, add new sentence after Figure 4.7-1 callout. Sentence to read: The figure also includes the boundaries of the private Native Alaska regional corporations. This EA analysis considers the Alaska Native villages and their local economies based primarily on subsistence hunting.

Table 2.4-3. Elmendorf F-22A Beddown Draft EA Public Comments (Page 5 of 7)

Resource	*Summarized Comment*	*EA Section and Response to Comments*
Noise/ Alaska Native Concerns/ Public Involvement	It states that the increase in sonic booms have the potential to disturb some Alaska Native users of land, but would not be expected to affect subsistence hunting. The Stony MOA covers a large area that includes several Alaska Native Villages along the Kuskokwim River including: Lime Village, Stony River, Sleetmute, Georgetown, Red Devil and others. Have surveys been completed to determine if the existing level of sonic booms can be heard in these communities and what the impacts of increased noise will have?	***See the following Sections –*** Section 2.2, Table 2.2-2; Section 4.6; Section 4.7; Section 4.9; and Section 4.10. ***EA Text Change:*** (on page 4-33) after: "During scoping, Alaska Natives expressed concern that existing and projected noise levels and sonic booms could affect game in traditional hunting areas and potentially impact the local economy dependent on these resources." Insert the following: During meetings held at Lime Village and Sleetmute under the Stony MOA for the Initial F-22 Beddown (Air Force 2001), Alaska Natives involved with subsistence hunting did not see noise as impacting game species (Air Force 2001a).
Cultural Resources	You have identified a potential "affect" in the Stony MOA and it is your responsibility to consult, in a meaningful manner, with these villages.	***Response:*** During the Initial F-22 Operational Wing Beddown EIS, the Air Force held scoping meetings and later public hearings at eight Alaska Native Villages under the airspace (Air Force 2001). Meeting attendees commented that they could hear sonic booms but were not bothered by them; also that game animals appeared to be unaffected by the noise. As described in this EA, based on responses to the Initial F-22 Operational Wing Beddown EIS (Air Force 2001), the Air Force held scoping meetings for this EA in Fairbanks and Anchorage. The Air Force sent meeting notices for the October 2005 meetings, to Alaska Native Villages, as well as copies of this Draft EA. As outlined in the EA, the Air Force has established procedures for noise complaints or damage complaints associated with sonic booms that begin with contacting the Elmendorf AFB Public Affairs Office at 907-552-5756. The Air Force also conducts monthly meetings (11AF Airspace and Ranges Committee) to provide a forum for discussing environmental questions and issues related to airspace. Any comments and complaints that are received by the Elmendorf Public Affairs Office are discussed for resolution during the meeting.

Resource	*Summarized Comment*	*EA Section and Response to Comments*
Land Use	In Land Use Alaska Natives is defined as one group of land owners. The Native Corporations are private entities and should be listed as "Private." Federal lands are also managed by the National Park Service. The State of Alaska land within the context of this study is likely managed by either the Departments of Fish and Game (ADFG) or Natural Resources (DNR). You also need to mention that while the land is managed by certain entities, the FAA has jurisdiction over the airspace above this land and is responsible for airspace use.	***EA Text Change:*** Page 4-35, Section 4.8.1, first paragraph, third sentence to read: Land ownership is a categorization of land according to type of owner. The major land ownership categories include state, federal, Alaska Native corporations, and other private landowners. Federal lands are described by the managing agency, which may include the USWFS, the U.S. Forest Service, BLM, or DOD. State of Alaska land under the study area is typically managed by the Departments of Fish and Game or Natural Resources. The land management plans include those documents prepared by agencies to establish appropriate goals for future use and development. As part of this process, sensitive land use areas are often identified by agencies as being worthy of more rigorous management. As noted in Section 4.1.1, FAA administers all navigable airspace above public and private lands. Add following sentence to end of second paragraph: As part of the mitigations identified in the MOA EIS ROD, the Air Force participates in the Resource Protection Council to work with agencies, Alaska Natives, and others in the identification and mitigation of potential consequences to environmental resources (Air Force 1995).
Land Use	In the Land Use section, the term "Special Use Areas" is used and is given some type of special categorization. Where did you get the term? Is it a term used in NEPA documents? Special use according to your definition is given to private land?	***EA Text Change:*** Page 4-35, Section 4.8.2, second paragraph to read: Special use areas provide recreational activities (trails and parks), hunting, fishing, and/or solitude or wilderness experience (parks, forests, and wilderness areas). Table 4.8-1 identifies special use areas under the airspace units. Figures 4.8-1 and 4.8-2 present these special use areas under or near training airspace. For the purpose of this EA, Alaska Native regional corporation private lands and village statistical areas are included with recreational areas. This broad grouping of special use areas includes large public land areas such as state or national parks, forests, and reserves which may include individual campgrounds, trails, and visitor centers. This broad definition of special use areas also includes large private land areas under the airspace.

Table 2.4-3. Elmendorf F-22A Beddown Draft EA Public Comments (Page 7 of 7)

Resource	*Summarized Comment*	*EA Section and Response to Comments*
Noise	How many noise complaints does the Air Force receive due to sonic booms in the MOAs? I wonder if the actual record accurately substantiates predictions made by previous studies?	***Response:*** Refer to Appendix E for information on the BOOMAP model. The model is based on extensive research at Nellis and Barry M. Goldwater ranges where monitors on the ground measuring the booms were correlated with aircraft speeds and locations being tracked as they maneuvered. The number of supersonic events that reached the ground became the basis of the internationally accepted model. Additional studies have been conducted to ascertain the degree of a population's annoyance with different annual average levels of noise and with the correlation of those levels with supersonic noise. These models are all based on multiple studies conducted over the past 30 years.

2.5 Regulatory Compliance

This EA has been prepared to satisfy the requirements of NEPA (Public Law [P.L.] 91-190, 42 USC 4321 *et seq*.) as amended in 1975 by P.L. 94-52 and P.L. 94-83. The intent of NEPA is to protect, restore, and enhance the environment through well-informed federal decisions. In addition, this document was prepared in accordance with Section 102 (2) of NEPA, regulations established by the CEQ (40 CFR 1500-1508), and AFI 32-7061 (i.e., 32 CFR Part 989).

Certain areas of federal legislation, such as the Endangered Species Act (ESA) and National Historic Preservation Act (NHPA), have been given special consideration in this EA. Implementation of the proposed beddown at Elmendorf AFB would require various federal and state reviews and permits.

Implementation of the Proposed Action through any of the three facility construction options would involve coordination with several organizations and agencies. Compliance with the ESA requires communication with the U.S. Fish and Wildlife Service (USFWS) in cases where a federal action could affect listed threatened or endangered species, species proposed for listing, or candidates for listing. The primary focus of this consultation is to request a determination of whether any of these species occur in the proposal area. If any of these species is present, a determination is made of any potential adverse effects on the species. Should no species protected by the ESA be affected by the Proposed Action, no additional action is required. Letters were sent to the appropriate USFWS and National Marine Fisheries Service offices as well as state agencies, informing them of the proposal and requesting data regarding applicable protected species. The USFWS replied that there are no federally listed or proposed species and/or designated or proposed critical habitat within the action area of the proposed project; therefore, no further action is required regarding ESA. The National Marine Fisheries Service replied that the Proposed Action will not result in any adverse effect to Essential Fish Habitat; therefore, no further consultation is necessary. Appendix C includes copies of relevant coordination letters sent by the Air Force.

The preservation of Alaska Native cultural resources is coordinated by the State Historic Preservation Office (SHPO), as mandated by the NHPA and its implementing regulations. Letters were sent to potentially affected Alaska Native communities informing them of the proposal (Appendix C). Further communication is included as part of this EA review process.

Elmendorf AFB is in attainment for all criteria pollutants and therefore an Air Conformity Review under the Clean Air Act (CAA) Amendments is not required as emissions for air pollutants is below the de minimis threshold. Elmendorf AFB will work with the Alaska Department of Environmental Conservation to prepare a permit to construct and operate new stationary sources.

Elmendorf AFB will prepare a pollution discharge elimination system permit and a construction Storm Water Pollution Prevention Plan (SWPPP).

2.6 Environmental Comparison of the Proposed Action Options and No Action Alternative

The following tables compare the environmental consequences by resource of the proposed F-22A beddown at Elmendorf AFB. Table 2.6-1 summarizes the consequences at Elmendorf AFB of implementing the Proposed Action through Option A, B, or C, and includes the No Action Alternative. This summary is derived from the detailed analyses presented in Chapter 3.0. Table 2.6-2 summarizes the environmental consequences for the proposed training SUA and the No Action Alternative, which are analyzed in detail in Chapter 4.0. Chapter 5.0 addresses cumulative consequences and finds that there are no significant cumulative environmental consequences resulting from an F-22A decision when added to other past, present, or reasonably foreseeable future federal and non-federal actions.

The Proposed Action is to beddown the Second F-22A Operational Wing at Elmendorf AFB.

Table 2.6-1. Summary of Impacts by Resource at Elmendorf AFB (Page 1 of 3)

	Option A	*Option B*	*Option C*	*No Action*
Airspace Management and Air Traffic Control	Anchorage Alaska Terminal Area (AATA) management of airspace would not be impacted by F-22A sorties.	Same as Option A.	Same as Option A.	Continued coordination with Federal Aviation Administration (FAA) to support civil aviation.
Noise	F-22A engines are more powerful and louder than F-15C or F-15E engines. The ability of the F-22A to take off without afterburners most of the time and the F-22As more rapid climb to altitude reduce the potential for off base noise generation. Northern portions of Elmendorf AFB will experience increased noise levels. Western portions of Fort Richardson would have decreased exposure. Off base areas expected to be within the 65 decibels (dB) noise contour are a portion of the Knik Arm, Port MacKenzie area, and part of the Port of Anchorage. These increased noise areas are not projected to impact human or natural resources in the areas. Construction noise will be temporary and have no long-term effect.	Aircraft operational noise would be the same as described under Option A. Construction noise would occur in two separate areas, but would be temporary and would not have any long-term effects.	Aircraft operational noise would be the same as described under Option A. Construction noise would occur in three separate areas, but would be temporary and would not have any long-term effects.	There would be no change in aircraft and no construction associated with F-22A aircraft beddown. Noise contours and conditions would remain the same as baseline conditions.
Safety	No change in off base safety conditions or in Bird-Aircraft Strike Hazard (BASH), munitions, or personnel safety. Removes fighter aircraft from parking in Elmendorf clear zones.	Same as Option A.	Same as Option A except some F-22As would park in Elmendorf clear zones.	Continuation of current safety conditions. F-15Cs would continue to park in clear zone.

Table 2.6-1. Summary of Impacts by Resource at Elmendorf AFB (Page 2 of 3)

	Option A	*Option B*	*Option C*	*No Action*
Air Quality	Construction emissions would produce localized, short-term elevated air pollutant concentrations. 191.5 tons of nitrogen oxides (NO_x) and 14.9 tons of particulate matter less than or equal to 10 micrometers in diameter (PM_{10}) are projected to be generated over the 4 year construction period. This localized elevation would be short-term and would not be expected to adversely impact air quality or visibility. Operational emissions are expected to be reduced due to new, more efficient equipment with improved pollution control. Aircraft emissions are projected to be minimally higher, but improved efficiency and reduced on-site aircraft maintenance should result in no change in air quality within the Anchorage area.	Operational and aircraft emissions expected to be the same as Option A. Construction emissions projected to include 156.5 tons of NO_x and 12.2 tons of PM_{10} over the 4 year construction period. This localized elevation would be short-term and would not be expected to adversely impact air quality or visibility.	Same as Option A except 186 tons of NO_x and 14.3 tons of PM_{10}.	No new construction and no change from current emissions.
Physical Resources	50 acres of soil disturbance in one area. No significant effect on earth or water resources, hazardous materials, hazardous wastes, or the Environmental Restoration Program (ERP). New hazardous materials associated with aircraft coatings to be handled in new maintenance facility.	A total of 40 acres of soil disturbance in two locations. Effects essentially same as Option A.	A total of 30 acres of soil disturbance in three locations. Effects essentially same as Option A.	No ground disturbing activities. Hazardous wastes would be generated at current levels.
Biological Resources	Up to 30 acres of a 50 to 60 year old second growth forest could be lost. Migratory songbirds, including two special-status species, could occur in this forest stand. Clearing this marginal habitat during breeding season could disrupt some nesting birds. Fugitive dust and soil erosion, and hazardous materials associated with F-22A stealth coatings would be controlled to protect water resources. Noise would not be expected to adversely affect beluga whales in the Knik Arm.	Same as Option A except that up to 20 acres of a 50 to 60 year old second growth forest could be lost.	Same as Option A except that up to 10 acres of a 50 to 60 year old second growth forest could be lost.	No construction activities would occur with the potential to impact biological resources.

Table 2.6-1. Summary of Impacts by Resource at Elmendorf AFB (Page 3 of 3)

	Option A	*Option B*	*Option C*	*No Action*
Cultural Resources	Two structures scheduled for demolition and one for renovation would be evaluated for potential eligibility as National Register of Historic Places (NRHP). As defined in the Integrated Cultural Resources Management Plan, State Historic Preservation Officer (SHPO) consultation would be performed on potentially eligible structures scheduled for demolition or exterior renovation. Unknown subsurface archaeological resources could be impacted by ground disturbing activities; Integrated Cultural Resources Management Plan guidelines would be followed.	Same as Option A except two structures scheduled for demolition and two for renovation would be evaluated for potential NRHP eligibility. SHPO consultation would be performed as described for Option A.	Same as Option B except that, in addition to the structures noted in Option B, Option C renovates two hangars in the Flightline Historic District. Any exterior renovation to these structures would require SHPO consultation.	No change to known or unknown cultural resources.
Land Use/ Transportation/ Recreation	Some extension of the 65 dB noise contour on the north portion of the base, over the Knik Arm, and over compatible land uses in the Port MacKenzie and Port of Anchorage areas. The west portion of Fort Richardson would have decreased noise levels. Short-term traffic congestion due to construction. Long-term slight reduction in traffic due to slight decrease in base personnel.	Same as Option A.	Same as Option A, except that project elements in variation from the Base General Plan.	No change to the noise environment on the base and nearby environs. No construction or personnel changes. No impact to traffic due to construction
Socioeconomics	$402 million construction cost. 1,904 temporary construction jobs. Personnel reduction of 669 positions or a 7.9 percent decrease in base employment. Secondary reduction of approximately 223 off base positions. Changes in employment not expected to be noticed in the dynamic Anchorage community.	Same as Option A except $323 million construction cost. 1,526 temporary construction jobs.	Same as Option A except $325 million construction cost. 1,536 temporary construction jobs.	No construction cost or benefits of temporary construction jobs. No F-22A induced change in base personnel.
Environmental Justice	The 65 dB noise contour does not extend off base into incompatible residential areas. No disproportionate impact upon minority or low-income populations or upon children.	Same as Option A.	Same as Option A.	No change to disadvantaged populations or children.

Table 2.6-2. Summary of Impacts by Resource for Training Special Use Airspace (Page 1 of 2)

	Proposed Action Options	*No Action*
Airspace Management and Air Traffic Control	No change in airspace management. F-22A aircraft typically fly at higher altitudes in Military Operations Areas (MOAs) and Air Traffic Control Assigned Airspaces (ATCAAs) and reduced training on Military Training Routes (MTRs) when compared with the F-15C or F-15E. This could minimally reduce the number of low level military aircraft at altitudes where the majority of general aviation activity occurs.	No change in airspace management or use. Continued F-15E traffic on MTRs.
Noise	No difference in subsonic noise from current conditions in MOAs. Minimally reduced noise on MTRs. Noticeable increase in sonic booms in Stony A/B from an existing 15 to an estimated 28 per month. Other MOAs increase by 1 to 4 per month from the existing 1 to 19 per month. Noise levels would increase by 1 to 3 CDNL (C-Weighted Day-Night Sound Level) in Yukon, Stony, and Fox MOAs and by 11.5 CDNL (from 33.6 to 45.1) under Naknek MOA. Sonic booms would not pose a health or other risk, but could increase annoyance.	Continuation of current noise levels from subsonic and supersonic flight. No increase in sonic booms in Stony, Fox, or Yukon MOAs.
Safety	No substantive change in or impacts to flight, ground, or other safety aspects. Reduced low-level flight by F-22A as compared with F-15E could minimally reduce military aircraft presence at general aviation altitudes. Improved situational awareness with F-22A systems facilitate see-and-avoid procedures. No safety impacts from chaff and flare use. Overall reduction in use of training munitions at approved ranges.	No change from existing training by F-15C and F-15E in airspace. Continued use of chaff and flares in training airspace.
Air Quality	Change in training aircraft mix from F-15E and F-15C to F-22A and F-15C would not affect air quality. Most existing and even more F-22A flights would occur at altitudes above the mixing level for pollutants. No air quality or visibility impacts.	No change in training aircraft. No effects on air quality.
Physical Resources	No anticipated impact to soils, water, or other physical resources. Increase in mylar chaff wrappings that fall to ground similar to existing flare wrappings and not expected to affect physical resources. No noticeable change in use of chaff or flares in training. Continued altitude restrictions on flare use in approved locations.	No change from existing conditions. Continued use of chaff and flares in authorized airspace.

Table 2.6-2. Training Special Use Airspace (Page 2 of 2)

	Proposed Action Options	*No Action*
Biological Resources	Subsonic noise essentially the same as current conditions. No change in effects to wildlife. Increase in sonic booms may startle some animals. However, wildlife in the affected MOAs have previously experienced sonic booms and are likely habituated. Increase in mylar pieces from chaff use would not be expected to affect biological resources.	No change from existing conditions with military training overflights and sonic booms. No increase in sonic booms with the potential to startle wildlife.
Cultural Resources	No impacts to historic properties under the airspace. Increase in sonic booms, when discernible, may disturb users of land, but would not be expected to affect subsistence hunting.	No change from existing conditions.
Land Use/ Transportation/ Recreation	No change in land use or transportation on base. No affect to land use or land use patterns under the airspace. Recreationists, hunters, and fishermen, particularly under the Stony MOAs, may discern an increase in sonic booms.	No change from existing conditions. Continued presence of military aircraft and sonic booms under training airspace.
Socioeconomics	No discernible effects on social or economic conditions under the airspace. Increase in sonic booms, where discernible, may disturb individuals participating in subsistence or recreational hunting and fishing. Any disturbance would not be expected to affect activities under the airspace or local economies that rely on subsistence resources.	No change from existing conditions. No increase in annoyance due to increased sonic booms.
Environmental Justice	High concentrations of Alaska Natives under the airspace representative of populations throughout the state. No disproportionate impact to minority and low-income populations. No noticeable impact to children.	No change from existing conditions. Continued military training in airspace over rural populations.

3.0 ELMENDORF AIR FORCE BASE AFFECTED ENVIRONMENT AND CONSEQUENCES

This chapter contains both the affected environment and environmental consequences analysis for all facility options to implement the Proposed Action at Elmendorf Air Force Base (AFB). The National Environmental Policy Act (NEPA) requires that the analysis address those areas and the components of the environment with the potential to be affected; locations and resources with no potential to be affected need not be analyzed.

Each resource discussion begins with a definition including resource attributes and any applicable regulations. The expected geographic scope of any potential consequences is identified as the Region of Influence (ROI). For most resources in this chapter, the ROI is defined as the boundaries of Elmendorf AFB. For some resources (such as Noise, Air Quality, and Socioeconomics), the ROI extends over a larger jurisdiction unique to the resource.

The *Existing Condition* of each relevant environmental resource is described to give the public and agency decision-makers a meaningful point from which they can compare potential future environmental, social, and economic effects. The *Environmental Consequences* section for each resource considers the direct and indirect effects of the facility construction options described in Chapter 2.0, including the No Action Alternative. Cumulative effects are discussed in Chapter 5.0.

3.1 Airspace Management and Air Traffic Control

The affected environment or ROI for aircraft operations at Elmendorf AFB includes the base and the airspace surrounding the airfield. This section explains airspace management and Section 3.1.1.2 presents the consequences of the proposed F-22A beddown.

3.1.1 *Definition of Elmendorf AFB Airspace Management and Air Traffic Control*

Airspace management and air traffic control is defined as the direction, control, and handling of flight operations in the "navigable airspace" that overlies the geopolitical borders of the United States (U.S.) and its territories. "Navigable airspace" is airspace above the minimum altitudes of flight prescribed by regulations under United States Code (USC) Title 49, Subtitle VII, Part A, and includes airspace needed to ensure safety in the takeoff and landing of aircraft, as defined in Federal Aviation Administration (FAA) Order 7400.2E (49 USC). This navigable airspace is a limited natural resource that Congress has charged the FAA to administer in the public interest as necessary to ensure the safety of aircraft and its efficient use (FAA Order 7400.2E 2000).

Training airspace or Special Use Airspace (SUA) identified for military and other governmental activities is charted and published by the FAA. This airspace is discussed in Section 4.1.2.

3.1.2 *Existing Conditions*

Elmendorf AFB manages airspace in accordance with processes and procedures detailed in Air Force Instruction (AFI) 13-201, *Air Force Airspace Management*. AFI 13-201 implements Air Force Planning Document 13-2, *Air Traffic Control, Airspace, Airfield, and Range Management*, and Department of Defense (DoD) Directive 5030.19, *DoD Responsibilities on Federal Aviation and*

National Airspace System Matters. This AFI addresses the aeronautical matters governing the efficient planning, acquisition, use, and management of airspace required to support United States Air Force (Air Force) flight operations (Air Force 2001b).

Airspace supporting operations at Elmendorf AFB is within the Anchorage Alaska Terminal Area (AATA). The AATA is divided into six segments: the International Segment; the Seward Highway Segment; the Lake Hood Segment; the Merrill Segment; the Elmendorf Segment; and, the Bryant Segment (3rd Wing [3 WG] 2004).

Class D controlled airspace has been established around Elmendorf AFB. This controlled airspace abuts the Class C controlled airspace around Anchorage International Airport to the southwest, and the Restricted Area R-2203 over Fort Richardson to the northeast. While the Elmendorf AFB control tower manages arrivals and departures at Elmendorf AFB, Anchorage Approach Control has overall responsibility for traffic management within the AATA. Detailed processes, procedures, and altitude separation requirements that must be followed by military and civilian pilots operating within the AATA are published in aeronautical charts.

Aircraft at Elmendorf AFB have flown in this airspace for more than 60 years without conflict with civil or commercial aviation. While the ATAA is congested, continued coordination between Elmendorf AFB Air Traffic Control (ATC) and Anchorage Approach Control minimizes conflicts.

3.1.3 Environmental Consequences

3.1.3.1 Option A

Option A would continue to have approximately 50,000 operations per year at Elmendorf. The proposed beddown of F-22A aircraft would result in a reduction of approximately 10 daily flying operations at Elmendorf (4 percent) as compared to current conditions. This minor reduction would not result in any modifications to Elmendorf Tower or AATA procedures

Elmendorf AFB actively supports AATA management of the regional airspace. That support includes transient military aircraft such as this C-5.

Elmendorf AFB control tower coordinates closely with the AATA to support military and civil aviation in the region. An example of this cooperation was the tight turning pattern applied to the 7,500 foot north-south runway while the 10,000 foot main runway was resurfaced during 2005. This pattern, instituted by Elmendorf Tower, reduced any potential for encroachment on Merrill Field, south of the runway. Under the proposed beddown of F-22A aircraft, Elmendorf AFB would continue to work closely with AATA. The overall effect would be no discernible impact to airspace management and ATC.

3.1.3.2 Option B

AATA and Elmendorf AFB responsibilities and capabilities would be the same as those described for Option A. No discernible impacts would be expected with Option B.

3.1.3.3 Option C

AATA and Elmendorf AFB responsibilities and capabilities would be the same as those described for Option A. No discernible impacts would be expected with Option C.

3.1.3.4 No Action

No Action would continue to have F-15C and F-15E aircraft using the AATA airspace for the foreseeable future. This would not place any consequences on airspace management or ATC.

3.2 Noise

3.2.1 Definition of Elmendorf AFB Noise

Noise is considered to be unwanted sound that interferes with normal activities or otherwise diminishes the quality of the environment. The noise may be intermittent or continuous, steady or impulsive. It may be stationary or transient. Stationary sources are normally related to specific land uses, e.g., housing tracts or industrial plants. Transient noise sources move through the environment, either along established paths (e.g., highways, railroads), or randomly (e.g., an aircraft flying in a block of training airspace such as a Military Operations Area [MOA]). There is wide diversity in responses to noise that not only vary according to the type of noise and the characteristics of the sound source, but also according to the sensitivity and expectations of the receptor, the time of day, and the distance between the noise source (e.g., an aircraft) and the receptor (e.g., a person or animal).

> Noise annoyance is further described in Appendix D, Aircraft Noise Analysis and Airspace Operations.

The physical characteristics of noise, or sound, include its *intensity*, *frequency*, and *duration*. Sound is created by acoustic energy, which produces minute pressure waves that travel through a medium, like air, and are sensed by the eardrum. This may be likened to the ripples in water that would be produced when a stone is dropped into it. As the acoustic energy increases, the intensity or amplitude of these pressure waves increase, and the ear senses louder noise. Sound intensity varies widely (from a soft whisper to a jet engine) and is measured on a logarithmic scale to accommodate this wide range. The use of logarithms is nothing more than a mathematical tool that simplifies dealing with very large and very small numbers. For example, the logarithm of the number 1,000,000 is 6, and the logarithm of the number 0.000001 is -6 (minus 6). Obviously, as more zeros are added before or after the decimal point, converting these numbers to their logarithms greatly simplifies calculations that use these numbers.

The frequency of sound is measured in cycles per second, or hertz (Hz). This measurement reflects the number of times per second the air vibrates from the acoustic energy. Low frequency sounds are heard as rumbles or roars, and high frequency sounds are heard as screeches. Sound measurement is further refined through the use of "A-weighting." The normal human ear can detect sounds that range in frequency from about 20 Hz to 15,000 Hz. However, all sounds throughout this range are not heard equally well. Therefore, through internal electronic circuitry, some sound meters are calibrated to emphasize frequencies in the 1,000 to 4,000 Hz range. The human ear is most sensitive to frequencies in this range, and sounds measured with these instruments are termed "A-weighted," and are shown in terms of A-weighted decibels.

The duration of a noise event, and the number of times noise events occur are also important considerations in assessing noise impacts.

The word "metric" is used to describe a standard of measurement. As used in environmental noise analysis, there are many different types of noise metrics. Each metric has a different physical meaning or interpretation and each metric was developed by researchers attempting to represent the effects of environmental noise.

The metrics that support the assessment of noise from aircraft operations associated with the proposal include the maximum sound level (L_{max}), the Sound Exposure Level (SEL), and Day-Night Average Sound Levels (L_{dn}). Each metric represents a "tier" for quantifying the noise environment, and is briefly discussed below. Section 4.2.1 and Appendix D also contain noise metric definitions.

Maximum Sound Level

L_{max} defines peak noise levels. L_{max} is the highest sound level measured during a single noise event (e.g., an aircraft overflight), and is the sound actually heard by a person on the ground. For an observer, the noise level starts at the ambient noise level, rises up to the maximum level as the aircraft flies closest to the observer, and returns to the ambient level as the aircraft recedes into the distance.

Sound Exposure Level

L_{max} alone may not represent how intrusive an aircraft noise event is because it does not consider the length of time that the noise persists. The SEL metric combines both of these characteristics into a single measure. It is important to note, however, that SEL does not directly represent the sound level heard at any given time, but rather provides a measure of the total exposure of the entire event. Its value represents all of the acoustic energy associated with the event, as though it was present for one second. Therefore, for sound events that last longer than one second, the SEL value will be higher than the L_{max} value. The SEL value is important because it is the value used to calculate other time-averaged noise metrics.

Time-Averaged Cumulative Day-Night Average Noise Metrics

The number of times aircraft noise events occur during given periods is also an important consideration in assessing noise impacts. The "cumulative" noise metrics that support the analysis of multiple time-varying aircraft events are L_{dn} and the Onset-Rate Adjusted Monthly Day-Night Average Sound Level (L_{dnmr}).

These metrics sum the individual noise events and average the resulting level over a specified length of time. Thus, it is a composite metric representing the maximum noise levels, the duration of the events, the number of events that occur, and the time of day during which they occur. These metrics add a 10 decibel (dB) penalty to those events that occur between 10:00 p.m. and 7:00 a.m. to account for the increased intrusiveness of noise events that occur at night when ambient noise levels are normally lower than during the daytime. These cumulative metric do not represent the variations in the sound level heard. Nevertheless, they do provide an excellent measure for comparing environmental noise exposures when there are multiple noise events to be considered.

Using measured sound levels as a basis, the Air Force developed several computer programs to calculate noise levels resulting from aircraft operations. Sound levels calculated by these programs have been extensively validated against measured data, and have been proven to be highly accurate.

In this document, the sound levels calculated for aircraft operations around Elmendorf AFB are all daily L_{dn}. L_{dn} metrics are the preferred noise metrics of the Department of Housing and Urban Development, the U.S. Department of Transportation, the FAA, the U.S. Environmental Protection Agency (USEPA), and the Veteran's Administration.

L_{dn} may be thought of as the continuous or cumulative A-weighted sound level which would be present if all of the variations in sound level which occur over the given period were smoothed out so as to contain the same total sound energy. While L_{dn} does provide a single measure of overall noise impact, it is fully recognized that it does not provide specific information on the number of noise events or the specific individual sound levels which do occur. For example, an L_{dn} of 65 dB could result from a very few noisy events, or a large number of less noisy events. Although it does not represent the sound level heard at any one particular time, it does represent the total sound exposure. Scientific studies and social surveys have found the L_{dn} to be the best measure to assess levels of community annoyance associated with all types of environmental noise. Therefore, its use is endorsed by the scientific community and governmental agencies (American National Standards Institute 1980, 1988; USEPA 1974; Federal Interagency Commission on Urban Noise 1980; Federal Interagency Commission on Noise 1992).

The ROI for noise consists of the area immediately surrounding Elmendorf AFB, as identified by the L_{dn} 65 noise contour.

3.2.2 Existing Conditions

Elmendorf AFB has supported a variety of aircraft and operations since its inception in the early 1940s. Aircraft and associated missions have ranged from World War II bombers and cargo aircraft to the current suite of 42 Primary Aircraft Inventory (PAI) F-15Cs, 18 F-15Es, 2 E-3s, 3 C-12s, and 16 C-130s. The variety of missions and aircraft over the years has formed the shape and extent of areas affected by aircraft operations and associated noise.

L_{DN}, or Day-Night Average Sound Level, is the most widely accepted metric for evaluation of noise around airfields.

Baseline noise levels, expressed as L_{dn}, were modeled based on aircraft types, runway use patterns, engine power settings, altitude profiles, flight track locations, airspeed, and other factors. To identify the areas affected by noise levels around the base, the Air Force's NOISEMAP program is used to calculate noise levels and generate noise contours. Then, the Air Force's NMPlot program is used to graphically plot these contours on a background map in 5 dB increments from 65 L_{dn} to 85 L_{dn}. In keeping with Elmendorf AFB noise abatement programs, no sorties by fighter aircraft are assumed to occur between 10 p.m. and 7 a.m. for normal training activity. Noise levels associated with current conditions are depicted in Figure 3.2-1.

Noise levels of 65 L_{dn} or greater mostly affect lands on Elmendorf AFB or Fort Richardson. Off base areas affected by noise levels of 65 L_{dn} or higher occur over water and, to a small degree, in the industrial Port of Anchorage. Table 3.2-1 details the extent of these areas exposed to elevated noise levels. Section 3.8 describes the land use implications of these noise levels.

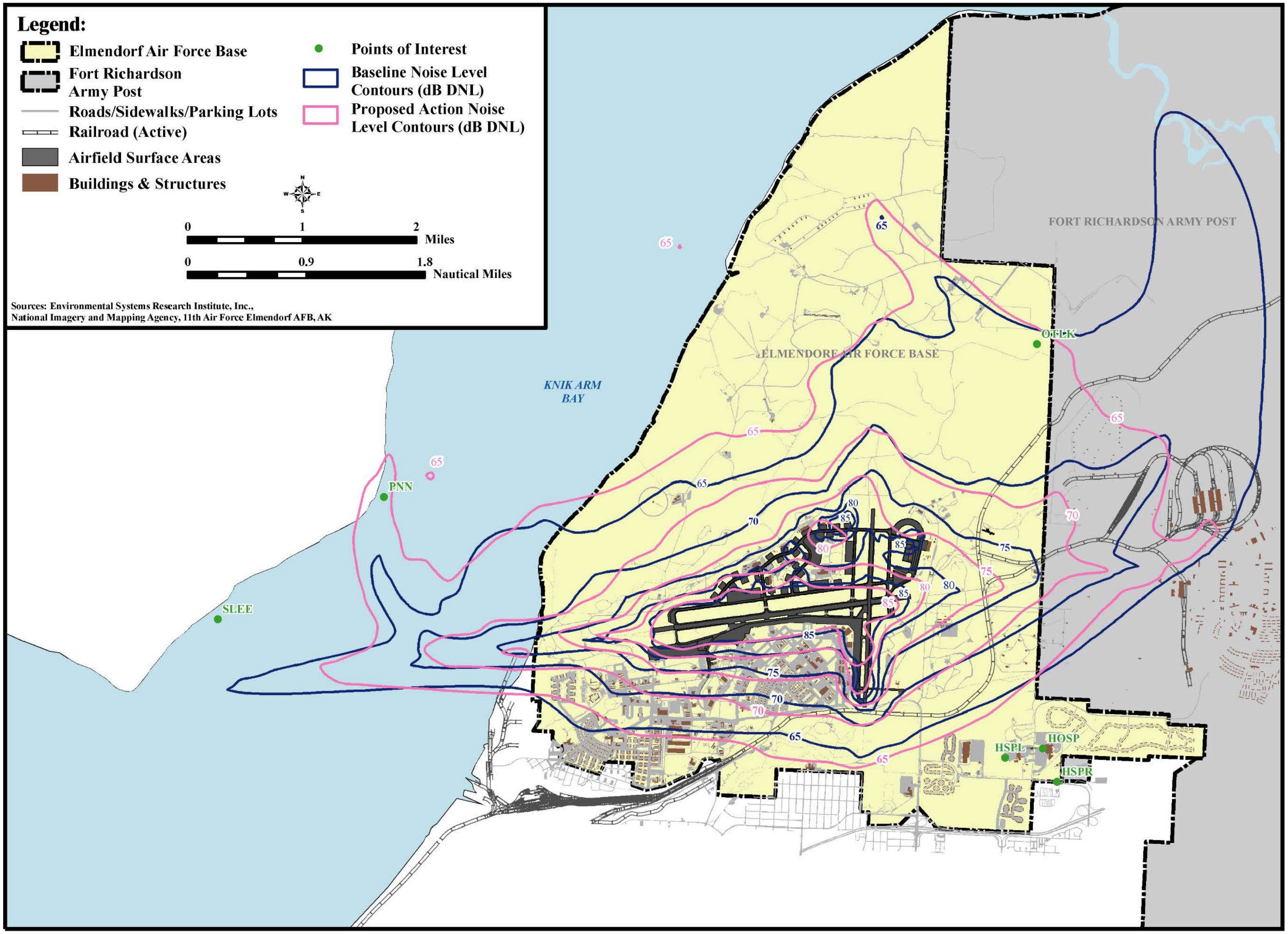


Figure 3.2-1. Baseline and Proposed Action Noise Contours

TABLE 3.2-1. LAND AREA NOISE EXPOSURES UNDER CURRENT CONDITIONS

Location	GEOGRAPHIC AREA (IN ACRES) EXPOSED TO INDICATED NOISE LEVELS (IN L_{DN})					
	65-70	*70-75*	*75-80*	*80-85*	*>85*	*Total*
Elmendorf AFB	3,345.5	1,711.6	1,208.9	613.4	663.8	7,543.2
Fort Richardson	3,125.9	600.6	--	--	--	3,726.5
Over Water	911.2	181.3	20.0	--	--	1,112.5
Port of Anchorage	24.2	6.5	2.5	--	--	33.2
Total	7,406.6	2,500.0	1,231.4	613.4	663.8	12,415.4

Source: Wasmer and Maunsell 2005.

Aircraft at Elmendorf AFB generally operate according to established flight paths and overfly the same areas surrounding the base. Military aircraft are designed for performance and the engines are noisy. Elmendorf AFB employs a quiet-hours program in which, barring a national emergency or a major exercise, fighter aircraft operations (take off and landing patterns as well as engine run-ups) are avoided after 10:00 p.m. and before 7:00 a.m. every day of the week. At Elmendorf AFB, noise exposure from airfield operations typically occur beneath main approach and departure corridors along both runways and in areas immediately adjacent to parking ramps and aircraft staging areas.

Noise due to construction and maintenance equipment, as well as general vehicle traffic is a common, ongoing occurrence in the base environment. Existing military construction projects are currently in progress at Elmendorf AFB. Trucks, as well as heavy equipment, are usually found in the base environment on a daily basis to support these existing facility and infrastructure upgrades.

3.2.3 ENVIRONMENTAL CONSEQUENCES

Based on the Langley AFB experience with operational F-22A aircraft, a set of flight operations assumptions has been incorporated into noise modeling for the F-22A operations at Elmendorf AFB. These F-22A flight operation assumptions are:

PUBLIC SCOPING CONCERNS REGARDING NOISE INCLUDED ANY DIFFERENCE BETWEEN NOISE GENERATION OF THE F-22A COMPARED TO THE F-15C OR F-15E.

- Current noise abatements procedures that exclude normal fighter operations between 10 p.m. and 7 a.m. are assumed to continue.
- F-22A afterburner takeoff profiles are based on experience with operational aircraft at Langley AFB. This results in a steeper climb-out for F-22A than for F-15C or F-15E aircraft.
- F-22A afterburner departures represent approximately 2 percent of F-22A departures based on experience with operational aircraft.
- F-22A MIL-Power departures are based on data gathered by the Elmendorf F-22A Integration Office from F-22A pilots at Langley AFB. Climb-rates and throttle settings are provided for takeoffs under visual meteorological conditions (VMC – 80 percent of the time) and instrument meteorological conditions (IMC – 20 percent of the time).

Table 3.2-2 compares the total area, in acres, exposed to each noise contour. Data reflect and compare current and projected noise exposure. Figure 3.2-1 shows the noise contours.

Table 3.2-2. Current and Projected Areas Exposed to Noise Levels Under Full Squadron Size

Location	*Condition*	Geographic Area (In Acres) Exposed to Indicated Noise Levels (In L_{DN})					
		65-70	*70-75*	*75-80*	*80-85*	*>85*	*Total*
Elmendorf AFB	Current	3,345.5	1,711.6	1,208.9	613.4	663.8	7,543.2
	Proposed	4,161.3	2,072.1	1,205.6	516.8	563.4	8,519.2
	Change	+815.8	+360.5	-3.2	-96.7	-100.4	+976.0
Fort Richardson	Current	3,125.9	600.6	0	0	0	3,726.5
	Proposed	1,151.6	136.7	0	0	0	1,288.4
	Change	-1,974.3	-4,463.9	0	0	0	-2,438.1
Over Water	Current	911.2	181.3	20.0	0	0	1,112.5
	Proposed	1,173.5	188.6	7.7	0	0	1,369.8
	Change	+262.3	+7.3	-12.3	0	0	+257.2
Port of Anchorage	Current	24.2	6.5	2.5	0	0	33.2
	Proposed	29.4	11.1	0.5	0	0	41.0
	Change	+5.2	+4.6	-2.0	0	0	+7.8
Port MacKenzie Area	Current	0	0	0	0	0	0
	Proposed	23.5	0	0	0	0	23.5
	Change	+23.5	0	0	0	0	+23.5

Source: Wasmer and Maunsell 2005.

The total geographic area exposed to L_{dn} 65 or more would be projected to decrease from 12,415.r acres under current conditions to 11,242 acres under the proposed beddown. The decrease of 1,173.6 acres represents a 9.5 percent reduction.

No off base civilian communities would be under the Proposed Action 65 dB noise contour. Satellite imagery demonstrates that the 23.5 acres in the Port MacKenzie area are vacant or in industrial uses. The Port of Anchorage is a compatible land use under the projected noise contours.

The reduction in the 65 L_{dn} contour on Fort Richardson results from the F-22A departure profiles reflecting the Langley AFB experience. The growth of the 65 L_{dn} contours over the Knik Arm west of the base is associated with the F-22A aircraft being held at relatively low approach altitudes on confined flight tracks by Anchorage Approach Control to deconflict traffic into and out of the several airports in the vicinity.

While the basis of the proposal involves the stationing of the F-22A aircraft at Elmendorf AFB, there are some variations pertaining to the development of the supporting infrastructure. These are addressed below.

3.2.3.1 Option A

Short-term noise increases due to construction and renovation, as well as infrastructure (storm water and electric lines) installment and realignment would occur. Construction occurs in stages; the earlier stage entails trucks, bulldozers, and other heavy construction equipment for the major construction projects (e.g., hangars, aircraft parking facilities, apron). This stage of construction would be temporary and isolated to those areas where construction would occur. Later stages of construction involve less heavy equipment, are also temporary, and occur in the same areas. Most of these projects would be undertaken adjacent to the flight line and occupy industrial areas, and would be isolated from any off base communities. In addition, construction would take place during daylight hours and would follow best management practices (BMPs) to minimize noise to any off base receptors. Construction noise would be contained within base environs since most heavy construction would occur near the flight line, where noise would be compatible with ongoing activities.

3.2.3.2 Option B

Under Option B, the number of annual sorties would be the same as those described in Option A; thus, the noise effects are identical. Option B includes a variation on the construction, renovation, and infrastructure improvement projects. The consequences to the noise environment would be similar to those described for Option A.

3.2.3.3 Option C

Option C is identical to Options A and B for flight activities, thus the consequences for noise would be as described in Section 3.2.3.1. Option C presents a variation on facility construction, however the consequences to the noise environment from construction would be similar to those described for Option A.

3.2.3.4 No Action

Under the No Action Alternative, the aircraft conversion would not occur. Noise levels around the airfield would remain as discussed in Section 3.1.

3.3 Safety

3.3.1 Definition of Elmendorf AFB Safety

This section addresses ground, flight, and explosive safety associated with operations conducted by the 3 WG at Elmendorf AFB. These operations include activities and operations conducted on the base itself, as well as training conducted in regional military training airspace. Ground safety considers issues associated with operations and maintenance activities that support base operations, including fire response. Flight safety considers aircraft flight risks. Explosive safety discusses the management and use of ordnance or munitions associated with airbase operations and training activities conducted in various elements of training airspace.

The safety ROI includes Elmendorf AFB and environs. Safety in military training airspace used by aircrews from the 3 WG is discussed in Section 4.3.

3.3.2 Existing Conditions

3.3.2.1 Ground Safety

Ongoing operations and maintenance activities conducted by the 3 WG are performed in accordance with applicable Air Force safety regulations, published Air Force Technical Orders, and standards prescribed by Air Force Occupational Safety and Health requirements. In 2005, the 3 WG experienced a Ground Operations fatality. While performing maintenance on an F-15 aircraft, a technician went to pick up a canopy safety strut, and fell from the maintenance platform to the hangar floor (personal communication, Madara 2005).

The 3 WG fire department provides fire and crash response at Elmendorf AFB. The unit has a sufficient number of trained and qualified personnel, and possesses all equipment necessary to respond to aircraft accidents and structure fires. There are no response-equipment shortfalls. There are several facilities, including aircraft hangars, which have documented fire safety deficiencies. These deficiencies primarily involve the need to either install or upgrade fire suppression systems (personal communication, Madara 2005).

To minimize the results of a potential accident involving aircraft operating from Elmendorf AFB, Clear Zones (CZs), Accident Potential Zones (APZs), and safety zones have been established around the airfield. In developing these zones, Elmendorf AFB is considered to have a Class B runway. These zones are shown in Figure 3.3-1 from the 2005 Base General Plan which also includes noise contours from that plan. Within clear and safety zones, construction is either prohibited (CZs) or limited in terms of placement and height (safety zones). Areas around the airfield where experience has shown most aircraft accidents occur are designated as APZs.

The CZ is an area 3,000 feet wide by 3,000 feet long for both Class A and Class B runways, and is located at the immediate end of the runway. The accident potential in this area is so high that no building is allowed. For safety reasons, the military is authorized to purchase the land for these areas if not already part of the installation (Air Force Civil Engineer Support Agency, U.S. Army Corps of Engineers [USACE], and Naval Facilities Engineering Command 2001).

APZ I is less critical than the CZ, but still possess significant potential for accidents. This 3,000-foot wide by 5,000 foot-long area located just beyond the CZ, has land use compatibility guidelines that allow a variety of industrial, manufacturing, transportation, communication, utilities, wholesale trade, open space and agricultural uses. Uses that concentrate people in small areas are not compatible (Air Force Civil Engineer Support Agency, USACE, and Naval Facilities Engineering Command 2001).

APZ II is less critical than APZ I, but still poses potential for accidents. APZ II is 3,000 feet wide and extends 7,000 feet beyond APZ I. Compatible land uses include those of APZ I, as well as low density single family residential, and those personal and business services and commercial retail trade uses with low intensity or scale of operation. High density functions such as multistory buildings, places of assembly (e.g., theaters, schools, churches and restaurants) and high density offices uses are not considered compatible (Air Force Civil Engineer Support Agency, USACE, and Naval Facilities Engineering Command 2001).

Unified Facilities Criteria 3-260-01 also specifies requirements for imaginary surfaces on and around the runway. These criteria specify encroachment-free standards along and on either

side of the runway (Air Force Civil Engineer Support Agency, USACE, and Naval Facilities Engineering Command 2001).

Currently, Elmendorf AFB is operating under waivers and exemptions to these criteria. These are detailed in Table 3.3-1.

Table 3.3-1. Airfield Waivers and Exemptions

	Number For Specified Types		
Type	*Clear Zone*	*Accident Potential Zone*	*Other*
Waivers	8	1	27
Exemptions	2	--	7

Source: Elmendorf AFB 2005; Personal communication, Madara 2005.

3.3.2.2 Flight Safety

The primary public concern with regard to flight safety is the potential for aircraft accidents. Such mishaps may occur as a result of weather-related accidents, mechanical failure, pilot error, mid-air collisions, collisions with manmade structures or terrain, or bird-aircraft collisions. Flight risks apply to all aircraft; they are not limited to the military.

The Air Force defines four major categories of aircraft mishaps: Classes A, B, C, and E, which includes High Accident Potential (HAP). Class A mishaps result in a loss of life, permanent total disability, a total cost in excess of $1 million, or destruction of an aircraft. Class B mishaps result in total costs of more than $200,000, but less than $1 million, result in permanent partial disability or inpatient hospitalization of three or more personnel. Class C mishaps involve reportable damage of more than $20,000, but less than $200,000; an injury resulting in any loss of time from work beyond the day or shift on which it occurred, or occupational illness that causes loss of time from work at any time; or an occupational injury or illness resulting in permanent change of job. HAP events are any hazardous occurrence that has a high potential for becoming a mishap. Class C mishaps and HAP, the most common types of accidents, represent relatively unimportant incidents because they generally involve minor damage and injuries, and rarely affect property or the public (Air Force 2004b). This Environmental Assessment (EA) will focus on Class A mishaps because of their potentially catastrophic results.

Based on historical data on mishaps at all installations, and under all conditions of flight, the military services calculate Class A mishap rates per 100,000 flying hours for each type of aircraft in the inventory. It should be noted that these mishap rates do not consider combat losses due to enemy action. In evaluating this information, it should be emphasized that data presented are only statistically predictive. The actual causes of mishaps are due to many factors, not simply the amount of flying time of the aircraft.

Mishap rates are statistically assessed as an occurrence rate per 100,000 flying hours. Figure 3.3-2 reflects the cumulative annual Class A mishap rates of the F-15 for the past 30 years. As the aircraft, the pilots who fly it, and the technicians who maintain it mature over time, mishap rates are reduced and maintain a relatively constant level.

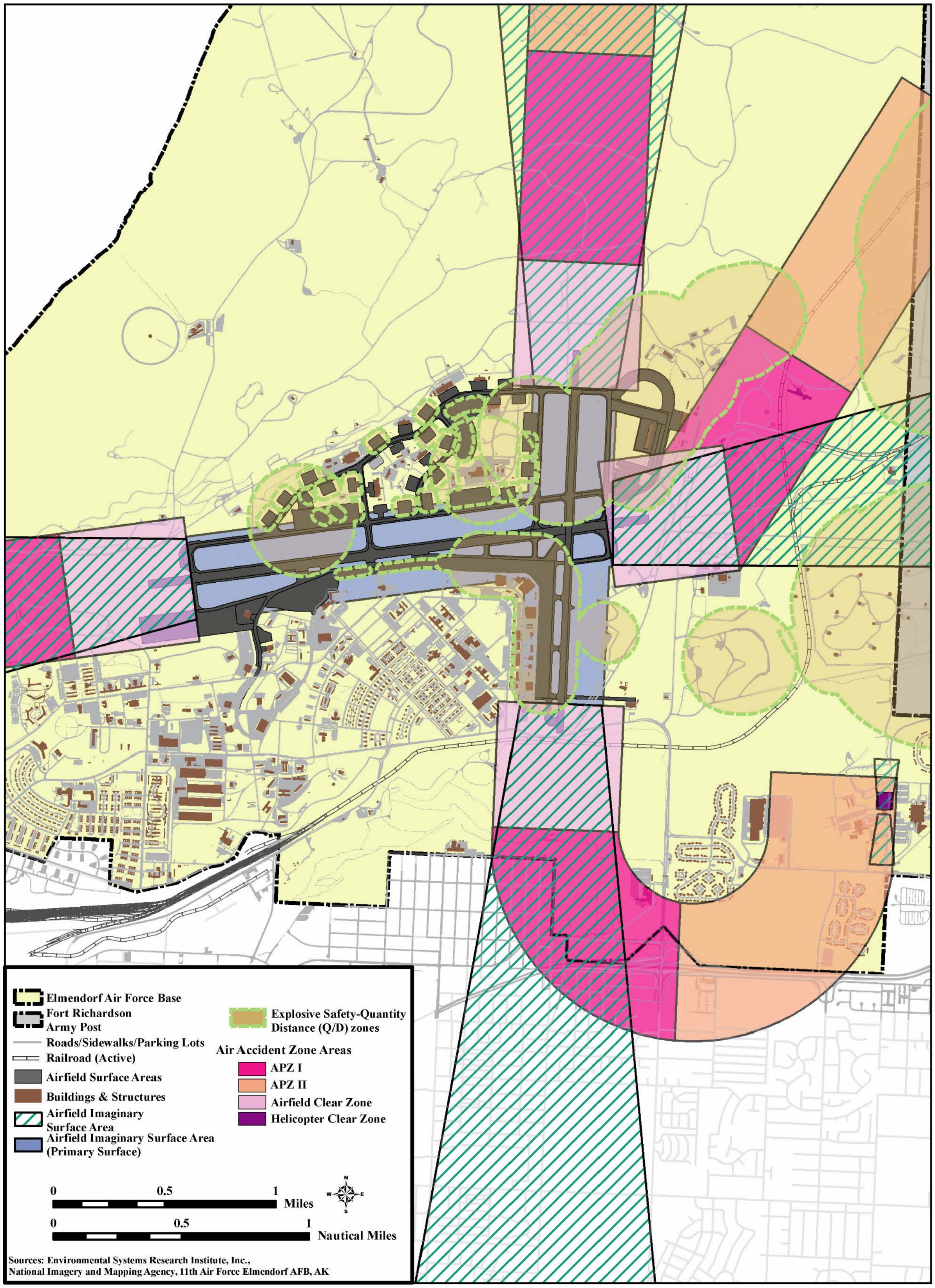
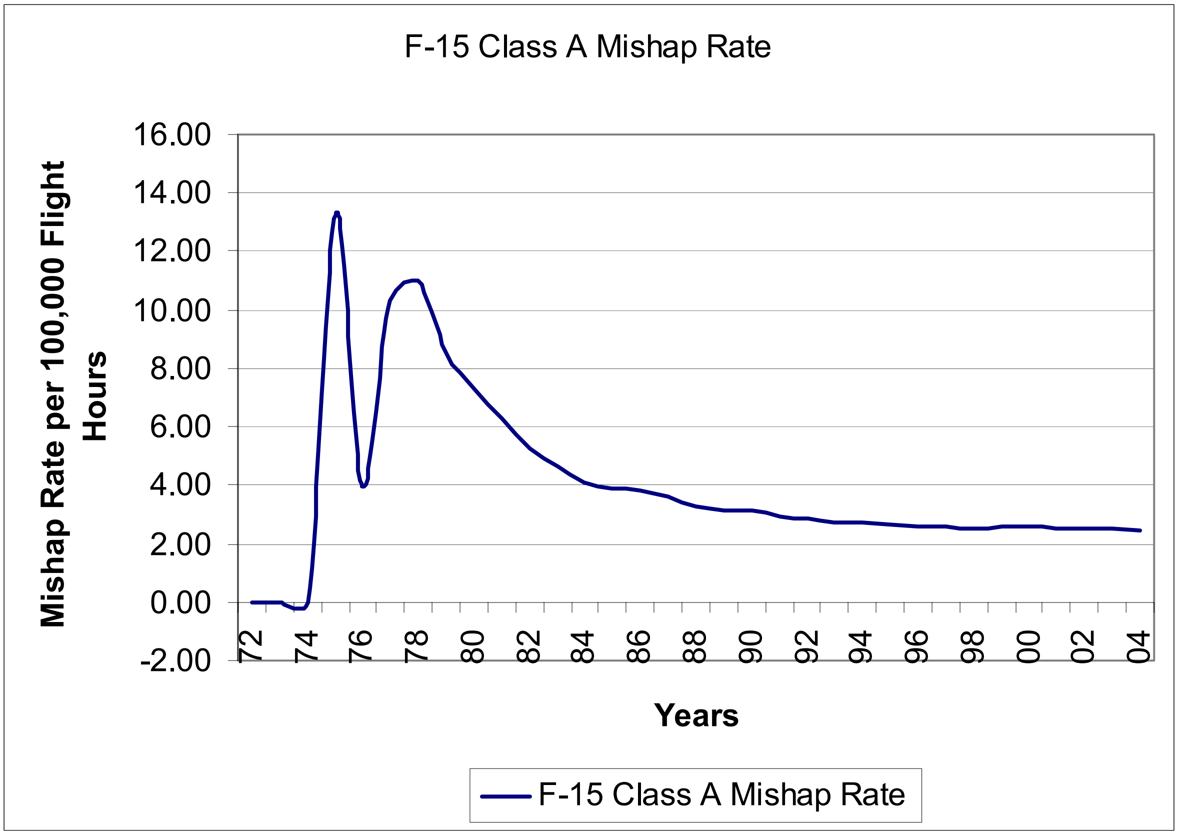


Figure 3.3-1. Elmendorf AFB Clear Zones and Accident Potential Zones



Source: Air Force Safety Center 2006.

Figure 3.3-2. F-15 Cumulative Class A Mishap Rates

3.3.2.3 Aircraft Mishaps

F-15 aircraft conduct the majority of sorties from Elmendorf AFB. In fiscal year (FY) 2000, which was one of the peak periods for operations, F-15 aircraft conducted approximately 10,000 sorties. If, on average, each aircraft spends approximately 10 minutes in the vicinity of the airfield, this means that F-15s accumulated approximately 1,667 flying hours around Elmendorf AFB. Considering all F-15s, since 1972 these aircraft have flown more than 4,998,100 hours. During that period, there have been 123 Class A mishaps, for a lifetime Class A mishap rate of 2.46 per 100,000 flying hours. Based on these data, a Class A mishap involving an Elmendorf-based F-15 in the vicinity of Elmendorf AFB would be projected to occur once every 24.4 years. To put this into perspective, the probability of a Class A mishap in the airfield environment for any given F-15 sortie is 0.000025.

Considering all operations at Elmendorf AFB, in more than 25 years there have been three Class A mishaps in the vicinity of the installation. Two were flight-related; one was non-flight-related. In 1995, an E-3 aircraft encountered a large flight of birds during takeoff. Birds were ingested into all engines resulting in a complete loss of power, and the aircraft crashed. In 2000, an aero club Cessna 152 departed controlled flight during a closed pattern, and crashed. In 1998, during engine shut down, a foreign object was ingested into the left engine of an F-15C while on the parking ramp. The aircraft did not crash although the dollar value of damages

resulting from this incident required classification as a Class A mishap (personal communication, Jennings 2005).

3.3.2.4 Wildlife Strike Hazard

Bird-aircraft strikes constitute a safety concern because they can result in damage to aircraft or injury to aircrews or local human populations if an aircraft crashes. Aircraft may encounter birds at altitudes up to 30,000 feet above mean sea level (MSL) or higher. However, most birds fly close to the ground. More than 97 percent of reported bird strikes occur below 3,000 feet above ground level (AGL). Approximately 30 percent of bird strikes happen in the airport environment, and almost 55 percent occur during low-altitude flight training (AFSC 2002).

Migratory waterfowl (e.g., ducks, geese, and swans) are the most hazardous birds to low-flying aircraft because of their size and their propensity for migrating in large flocks at a variety of elevations and times of day. Waterfowl vary considerably in size, from 1 to 2 pounds for ducks, 5 to 8 pounds for geese, and up to 20 pounds for most swans. There are two normal migratory seasons, fall and spring. Waterfowl are usually only a hazard during migratory seasons. These birds typically migrate at night and generally fly between 1,000 to 2,500 feet AGL during migration.

In addition to waterfowl, raptors, shorebirds, gulls, songbirds, and other birds also pose a hazard. In considering severity, the results of bird-aircraft strikes in restricted areas show that strikes involving raptors result in the majority of Class A and Class B mishaps related to bird-aircraft strikes. Raptors of greatest concern in the ROI are eagles and hawks. In Alaska, peak migration periods for waterfowl and raptors are from August to October and from April to May. A few bald eagles winter in the vicinity of Elmendorf AFB. In general, flights above 1,500 feet AGL would be above most migrating and wintering raptors.

Songbirds are small birds, usually less than one pound. During nocturnal migration periods, they navigate along major rivers, typically between 500 to 3,000 feet AGL. The potential for bird-aircraft strikes is greatest in areas used as migration corridors (flyways) or where birds congregate for foraging or resting (e.g., open water bodies, rivers, and wetlands).

While any bird-aircraft strike has the potential to be serious, many result in little or no damage to the aircraft, and only a minute portion result in a Class A mishap. During the years 1985 to 2004, the Air Force Bird-Aircraft Strike Hazard (BASH) Team documented 59,156 bird strikes worldwide. Of these, 25 resulted in Class A mishaps where the aircraft was destroyed. These occurrences constituted approximately 0.04 percent of all reported bird-aircraft strikes (AFSC 2004).

The 3 WG has developed aggressive procedures designed to minimize the occurrence of bird-aircraft strikes. The unit has documented detailed procedures to monitor and react to heightened risk of bird-strikes (Elmendorf AFB 2003), and when risk increases, limits are placed on low altitude flight and some types of training (e.g., multiple approaches, closed pattern work, etc.) in the airport environment. Special briefings are provided to pilots whenever the potential exists for greater bird-strike sightings within the airspace. Training and signs in open areas emphasize individual responsibilities and actions. Bird hazards exist on Elmendorf AFB year-round. Risk increases during spring and fall migration periods. Species of particular concern include Canada geese, swans, other waterfowl, sandhill cranes, gulls, raptors, and owls (Elmendorf AFB 2003). In the last 3 years, 3 WG aircraft have experienced approximately five bird-strikes per year in the airfield environment (personal communication, Jennings 2005).

Other wildlife of concern to flying operations at Elmendorf AFB include moose, wolves, coyotes, fox, bears, and smaller mammals (Elmendorf AFB 2003). Aggressive habitat management, fencing, active and passive dispersal techniques, and effective warning techniques serve to reduce the wildlife strike hazard at Elmendorf AFB (Elmendorf AFB 2003). For example, security fencing around the airfield excludes most large mammals.

3.3.2.5 Explosives Safety

All activities associated with the receipt, processing, transportation, storage maintenance, and loading of munitions items is accomplished by qualified technicians in accordance with DoD and Air Force technical procedures. The 3 WG has sufficient storage facilities and space for the storage and processing of mission-required ordnance items (personal communication, Norby 2005). There are two explosive safety waivers in effect at Elmendorf AFB. These involve two storage facilities whose safety arc encroaches on an on base transportation route (personal communication, Norby 2005).

There are three “hot cargo” pads on the installation, which are sufficient for handling explosive cargo. The primary pad is located near the eastern end of Runway 06/24. Additionally, there are two secondary pads. One is located toward the western end of Runway 06/24; the other is located off the extreme eastern end of Runway 06/24. All of the pads are situated north of the runway.

If required, support for explosive ordnance disposal (EOD) is provided by an active duty Air Force unit stationed at Elmendorf AFB. EOD requirements at Elmendorf AFB are also supported by an EOD range on the installation (personal communication, Norby 2005).

Section 2.2.2 and 2.2.3 describes existing F-15C and F-15E munitions and chaff and flare use as well as proposed use with a combination of F-15C and F-22A aircraft. Adequate capacity exists at Elmendorf to safely handle munitions currently used and the level of proposed use.

3.3.3 Environmental Consequences

3.3.3.1 Option A

An F-22A beddown would essentially replace existing F-15C and F-15E aircraft that have been in the Air Force inventory for decades with a new aircraft. Elmendorf AFB aircraft ground safety conditions would not change as a result of the F-22A beddown.

Historically, when new military aircraft first enter the inventory, the flight safety accident rate is higher. Safety data are limited for the F-22A because it is a new aircraft with multiple complex systems. These systems are undergoing refinement as the F-22A transitions from a test and training platform to an operational system. Class A mishaps are calculated on a basis of 100,000 flight hours. The F-22A has not yet achieved the level of flight hours. During test activities and weapons system development, the F-22A has had two Class A mishaps; this is not unusual for a new aircraft.

As the F-22A becomes operationally mature, the aircraft mishaps rate is expected to become comparable to that of the F-15, a similarly sized aircraft with a similar mission (see Section 3.3.2.3). Historical trends show that mishaps of all types decrease the longer an aircraft is operational as operations and maintenance personnel learn more about the aircraft’s capabilities and limitations. Some of this experience has already been gained for the F-22A. Experience gained with F-22A test programs training and the Initial Operational Wing will provide

substantial knowledge about the F-22A safest flight regime. Such safety factors as computer self checks and simplified maintenance will permit the F-22A to operate as safely as, if not more safely than, the F-15C and F-15E.

Since the F-22A would operate in the same airfield environment as the F-15C and F-15E, the overall potential for bird-aircraft or wildlife strikes would decrease minimally because of the decrease in the number of F-22A and F-15C aircraft assigned compared to the number of F-15C and F-15E realigned. The potential for bird-aircraft strikes would be mitigated to some degree because the F-22A would more rapidly attain altitudes above where the majority of the strikes occur. Aircraft safety and bird-aircraft strikes under Option A are not expected to measurably differ from baseline conditions.

Elmendorf AFB has an active BASH program to reduce the potential for bird and wildlife strikes and enhance airfield safety.

The amount of munitions associated with the two F-22A squadrons is projected to be lower than that associated with the existing F-15E squadron. The number of chaff bundles would remain unchanged with the F-22A and F-15C mix and the number of flares deployed would remain the same. Elmendorf AFB has the personnel and facilities to handle the level of munitions and chaff and flares associated with implementing Option A.

A safety question raised during scoping asked whether the F-22A would dump fuel in an emergency. The F-22A stealth requirements do not include such items as a fuel dump valve that could provide a radar signature. The F-22A does not have the ability to dump fuel.

Other Elmendorf activities, including the construction of new buildings and facilities under Option A would not take place in CZs or APZs. The construction would be consistent with the Base General Plan and construction safety procedures would be part of any construction contract. The change in personnel is not expected to have an effect on safety.

3.3.3.2 Option B

Option B includes a variation on the construction, renovation, and infrastructure improvement projects. This option is also consistent with the Base General Plan. Option B aircraft operations, BASH risks, munitions handling, and personnel changes are as described in Option A.

3.3.3.3 Option C

Option C flight activities, BASH risks, munitions handling, and personnel changes are essentially the same as those described for Option A. Option C does present a variation on facility construction that uses and/or modifies facilities vacated by the Base Realignment and Closure (BRAC) relocation of F-15C and F-15E aircraft. New F-22A facilities would be constructed in the FTE area although aircraft storage locations would be split into three areas. As a result, some F-22A aircraft would be located in a CZ where current aircraft are located. While Option C maintains the current safety conditions, it is less safe than Options A or B due to aircraft parked in the lateral CZ.

3.3.3.4 No Action

Under the No Action Alternative, F-22A aircraft would not be assigned to Elmendorf AFB and no F-22A related facility construction or personnel changes would occur. Consequently, there would be no change to safety and the location of parked F-15C aircraft within a CZ would continue.

3.4 Air Quality

This section discusses air quality considerations and conditions in the area around Elmendorf AFB near Anchorage, Alaska. It addresses air quality standards, describes current air quality conditions in the region, and presents the environmental consequences to Elmendorf AFB.

3.4.1 Definition of Elmendorf AFB Air Quality

Federal Air Quality Standards. Air quality is determined by the type and concentration of pollutants in the atmosphere, the size and topography of the air basin, and local and regional meteorological influences. The significance of a pollutant concentration in a region or geographical area is determined by comparing it to federal and/or state ambient air quality standards. Under the authority of the Clean Air Act (CAA), the USEPA has established nationwide air quality standards to protect public health and welfare, with an adequate margin of safety.

These federal standards, known as the National Ambient Air Quality Standards (NAAQS), represent the maximum allowable atmospheric concentrations and were developed for six "criteria" pollutants: ozone (O_3), nitrogen dioxide (NO_2), carbon monoxide (CO), respirable particulate matter less than or equal to 10 micrometers in diameter (PM_{10}), sulfur dioxide (SO_2), and lead (Pb). The NAAQS are defined in terms of concentration (e.g., parts per million [ppm] or micrograms per cubic meter [$\mu g/m^3$]) determined over various periods of time (averaging periods). Short-term standards (1-hour, 8-hour, or 24-hour periods) were established for pollutants with acute health effects and may not be exceeded more than once a year. Long-term standards (annual periods) were established for pollutants with chronic health effects and may never be exceeded.

Based on measured ambient criteria pollutant data, the USEPA designates areas of the U.S. as having air quality equal to or better than the NAAQS (attainment) or worse than the NAAQS (nonattainment). Upon achieving attainment, areas are considered to be in maintenance status for a period of 10 or more years. Areas are designated as unclassifiable for a pollutant when there is insufficient ambient air quality data for the USEPA to form a basis of attainment status. For the purpose of applying air quality regulations, unclassifiable areas are treated similar to areas that are in attainment of the NAAQS.

The USEPA recently promulgated attainment designations for the newly established 8-hour O_3 standard effective as of June 15, 2004. Meanwhile, states must continue to implement existing plans developed under the 1-hour standard during the transition to the new 8-hour standard. On December 17, 2004, the USEPA designated areas as attainment or nonattainment for the newly developed standard for particulates less than 2.5 micrometers in diameter ($PM_{2.5}$), which are fine particulates that have not been previously regulated (USEPA 2005a).

State Air Quality Standards. Under the CAA, state and local agencies may establish ambient air quality standards and regulations of their own, provided that these are at least as stringent as the federal requirements. The State of Alaska has air quality standards that are identical to

the federal standards. A summary of the NAAQS that apply to the proposed project area is presented in Table 3-4-1.

Table 3-4-1. National and Alaska Ambient Air Quality Standards

Air Pollutant	*Averaging Time*	NAAQS	
		Primary	*Secondary*
Carbon Monoxide (CO)	8-hour 1-hour	9 ppm (10 μg/m³) 35 ppm (40 μg/m³)	--- ---
Nitrogen Dioxide (NO_2)	AAM	0.053 ppm (100 μg/m³)	0.053 ppm (100 μg/m³)
Sulfur Dioxide (SO_2)	AAM 24-hour 3-hour	0.03 ppm (80 μg/m³) 0.14 ppm (365 μg/m³) ---	--- --- 0.5 ppm (1,300 μg/m³)
Particulate Matter (PM_{10})	AAM 24-hr	50 μg/m³ 150 μg/m³	50 μg/m³ 150 μg/m³
Particulate Matter ($PM_{2.5}$)[1]	AAM 24-hour	15 μg/m³ 65 μg/m³	15 μg/m³ 65 μg/m³
Ozone (O_3)[2]	8-hour	0.08 ppm	0.08 ppm
Lead (Pb) & Lead Compounds	3-month	1.5 μg/m³	1.5 μg/m³

Notes: 1. The $PM_{2.5}$ standard (particulate matter with a 2.5 μm diameter or smaller) was promulgated in December 2004 and is in effect as of 5 April 2005. The standard will be implemented over the next few years.
2. The 8-hour O_3 standard replaced the 1-hour standard in June 2005.
AAM = Annual Arithmetic Mean; ppm = parts per million; μg/m³ = micrograms per cubic meter.

Sources: 40 Code of Federal Regulations (CFR) 50.

State Implementation Plan. For non-attainment regions, the states are required to develop a State Implementation Plan (SIP) designed to eliminate or reduce the severity and number of NAAQS violations, with an underlying goal to bring state air quality conditions into (and maintain) compliance with the NAAQS by specific deadlines. The SIP is the primary means for the implementation, maintenance, and enforcement of the measures needed to attain and maintain the NAAQS in each state.

Visibility. CAA Section 169A established the additional goal of prevention of further visibility impairment in Prevention of Significant Deterioration (PSD) Class I areas. Visibility impairment is defined as a reduction in the visual range and atmospheric discoloration. Determination of the significance of an activity on visibility in a PSD Class I area is typically associated with evaluation of stationary source contributions. The USEPA is implementing a Regional Haze rule for PSD Class I areas that will address contributions from mobile sources and pollution transported from other states or regions.

Emission levels are used to qualitatively assess potential impairment to visibility in PSD Class I areas. Decreased visibility may potentially result from elevated concentrations of PM_{10} and SO_2 in the lower atmosphere.

General Conformity. CAA Section 176(c), General Conformity, established certain statutory requirements for federal agencies with proposed federal activities to demonstrate conformity of the proposed activities with each state's SIP for attainment of the NAAQS. Federal activities must not:

(a) cause or contribute to any new violation;

(b) increase the frequency or severity of any existing violation; or

(c) delay timely attainment of any standard, interim emission reductions, or milestones in conformity to a SIP's purpose of eliminating or reducing the severity and number of NAAQS violations or achieving attainment of NAAQS.

General conformity applies only to nonattainment and maintenance areas. If the emissions from a federal action proposed in a nonattainment area exceed annual thresholds identified in the rule, a conformity determination is required of that action. The thresholds become more restrictive as the severity of the nonattainment status of the region increases.

Stationary Source Operating Permits. In Alaska, the Alaska Department of Environmental Conservation has primary jurisdiction over air quality and stationary source emissions at Elmendorf AFB. Title V of the CAA Amendments of 1990 requires states to issue Federal Operating Permits for major stationary sources. A major stationary source in an attainment or maintenance area is a facility (i.e., plant, base, or activity) that emits more than 100 tons per year (TPY) of any one criteria air pollutant, 10 TPY of a hazardous air pollutant, or 25 TPY of any combination of hazardous air pollutants. Thresholds are lower for pollutants for which a region is in nonattainment status. The purpose of the permitting rule is to establish regulatory control over large, industrial activities and to monitor their impact upon air quality.

3.4.2 EXISTING CONDITIONS

Regional Air Quality. Federal regulations at 40 Code of Federal Regulations (CFR) 81 delineate certain air quality control regions (AQCRs), which were originally designated based on population and topographic criteria closely approximating each air basin. The potential influence of emissions on regional air quality would typically be confined to the air basin in which the emissions occur. Elmendorf AFB is located on the outskirts of Anchorage within the Cook Inlet Intrastate AQCR (AQCR 8), which encompasses 44,000 square miles including the municipality of Anchorage, the Kenai Peninsula Borough, and the Matanuska-Susitna Borough (40 CFR 81).

Attainment Status. A review of federally published attainment status for Alaska indicated that Anchorage is in attainment of NAAQS for all criteria pollutants except for the community of Eagle River, which is designated as nonattainment for PM_{10}, and located approximately 10 miles northeast of Elmendorf AFB. Also, a portion of Anchorage recently achieved attainment for CO in 2002, and is currently operating under a maintenance plan to assure continued attainment with the standard. The plan relies on control strategies needed to assure attainment of the NAAQS for CO. The strategy focuses on the Federal Motor Vehicle Emission Control Program, I/M program, ethanol-blended gasoline program, wintertime transit service, and promotion of engine preheaters. Elmendorf AFB is located adjacent to the northern boundary of this CO maintenance area.

PSD Class I Areas. No mandatory federal PSD Class I areas are located within the ROI. The nearest PSD Class I area is Denali National Park, which is 100 miles north-northwest of Elmendorf AFB.

Climate. Elmendorf AFB is located in the maritime zone of south-central Alaska, with moderate temperatures in both winter and summer. Mean annual precipitation is approximately 16 inches, with snowfall averaging around 80 inches per year. Summertime highs average in the low to mid-60s and wintertime lows average in the low to mid-single digits Fahrenheit. Prevailing winds in Anchorage are generally light and from the north to northeast during September through April and from the south to southwest from May to August. Seasonal mixing heights for Anchorage, which is the upper limit of the atmosphere in which ground-based emissions are expected to affect air quality, average around 2,000 feet and may reach 1,000 feet during winter months.

Current Emissions. Air emissions at Elmendorf AFB result from stationary and mobile sources. Stationary sources include boilers, emergency generators, and aircraft maintenance operations. Mobile sources include ground-based vehicles and aircraft. Elmendorf AFB is considered to be a major source of air emissions. For permitting purposes, Elmendorf AFB has been divided into nine different facilities based on their industrial classifications, rather than on their collective ownership and control by the Air Force. Only two of eight facilities, the Elmendorf Hospital and the Elmendorf Flightline, have potential criteria pollutant emissions large enough to require federal Title V operating permits. Elmendorf AFB also holds Owner Requested Limits, not included in the Title V permits, for Fire Protection Pumps and Road Painting. A recent summary of potential emissions is presented in Table 3.4-2.

TABLE 3.4-2. BASELINE POTENTIAL STATIONARY SOURCE EMISSIONS AT ELMENDORF AFB

Description	ANNUAL EMISSIONS (TONS PER YEAR)				
	NO_x	*CO*	*PM_{10}*	*SO_x*	*VOC*
Flight Line	164	99	27	158	29
Communications	54	15	6	29	14
Real Estate	111	92	12	1	6
Automotive Repair and Services	5	4	3	< 1	6
Health Services	58	33	4	26	3
Admin/Engineering	84	54	14	9	5
Fire Prevention	38	13	3	4	3
National Security	3	2	< 1	< 1	< 1

NO_x = nitrogen oxides; CO = carbon monoxide; PM_{10} = particulate matter less than or equal to 10 micrometers in diameter; SO_x = sulfur oxides; VOC = volatile organic compound
Source: Air Force 2005b.

Mobile source emissions have not been apportioned based on industrial classifications. A total of 41,340 aircraft operations occurred at Elmendorf AFB during 2005. These operations involved a total of 83 aircraft based at Elmendorf, plus a range of transient users. A survey was conducted in 2002 to estimate mobile source emissions, which are presented in Table 3.4-3.

Table 3.4-3. Baseline Mobile Source Emissions at Elmendorf AFB

Description	Annual Emissions (tons per year)				
	NO_x	*CO*	*PM_{10}*	*SO_x*	*VOC*
Aircraft based at Elmendorf AFB	529	353	95	144	59
Transient Aircraft	72	150	43	17	8
On-Wing Engine Testing	17	1	< 1	< 1	< 1
Aerospace Ground Support Equipment	175	25	8	5	1
Non-Road/Non-Vehicle Equipment	< 1	8	3	< 1	< 1
Government-Owned Vehicles	13	73	7	12	1
Privately-Owned Vehicles	33	367	24	215	3
TOTAL	**840**	**967**	**180**	**393**	**73**

NO_x = nitrogen oxides; CO = carbon monoxide; PM_{10} = particulate matter less than or equal to 10 micrometers in diameter; SO_x = sulfur oxides; VOC = volatile organic compound
Source: Air Force 2005b.

Regional Air Emissions. The previous section lists on-base emissions for Elmendorf AFB. The NEPA process, however, must also consider impacts from indirect emissions from stationary and mobile sources related to the project, some of which (for example, commuting of new employees to and from the facility) occur outside of the installation. For comparison purposes, Table 3.4-4 lists emissions for Greater Anchorage Area, and for Cook Inlet AQCR (AQCR 8, which includes the borough).

Table 3.4-4. Regional Emissions for Elmendorf AFB Affected Environment

	Pollutants (In Tons per Year)				
	NO_x	*CO*	*PM_{10}*	*SO_2*	*VOC*
Greater Anchorage Area	10,740	123,883	19,856	920	5,764
Total Cook Inlet AQCR	28,203	332,021	67,013	1,780	56,708

NO_x = nitrogen oxides; CO = carbon monoxide; PM_{10} = particulate matter less than or equal to 10 micrometers in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound
Source: USEPA 2005b.

3.4.3 Environmental Consequences

Air emissions resulting from the proposed F-22A beddown were evaluated in accordance with federal, state, and local air pollution standards and regulations. Air quality impacts from a proposed activity or action would be significant if they:

- increase ambient air pollution concentrations above any NAAQS;
- contribute to an existing violation of any NAAQS;
- interfere with or delay timely attainment of NAAQS; or
- impair visibility within any federally mandated federal Class I area.

The approach to the air quality analysis was to estimate any increase in emission levels due to the proposed beddown.

According to USEPA's General Conformity Rule in 40 CFR Part 51, Subpart W, any proposed federal action that has the potential to cause violations in a NAAQS nonattainment or maintenance area must undergo a conformity analysis. Since Elmendorf AFB is in attainment for all criteria pollutants, the anticipated emission resulting from the Proposed Action have been analyzed and it has been determined that the emissions will not cause or contribute to a new NAAQS violation. Furthermore, a conformity determination is not required as the emissions for all pollutants is below the de minimis threshold established by the USEPA in 40 CFR 93.153.

PSD regulations protect the air quality in regions that already meet the NAAQS. The nearest PSD Class I area is approximately 100 miles from the region potentially affected by the Proposed Action. Therefore, the Proposed Action would be unlikely to have a significant impact on any PSD Class I areas.

3.4.3.1 Option A

Option A would involve the drawdown of F-15C and F-15E aircraft, beddown of F-22A aircraft, and associated construction, demolition, grading, and paving projects.

Construction Emissions. Emissions during the construction period were quantified to determine the potential impacts on regional air quality. Calculations of volatile organic compounds (VOCs), nitrogen oxides (NO_x), CO, and PM_{10} emissions from construction, grading, and paving activities were performed using USEPA emission factors compiled in the *California Environmental Quality Air Quality Handbook* (South Coast Air Quality Management District 1993), *Calculations Methods for Criteria Air Pollution Emission Inventories* (Jagielski and O'Brien 1994), and *Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations* (O'Brien and Wade 2002). The emission factors for building construction include contributions from engine exhaust emissions (i.e., construction equipment, material handling, and workers' travel) and fugitive dust emissions (e.g., from grading activities). Demolition emissions evaluated include fugitive dust and transport of demolition debris offsite. Site preparation, grading, and trenching emissions include fugitive dust from ground disturbance, plus combustive emissions from heavy equipment during the entire construction period. Paving emissions include combustive emissions from bulldozers, rollers, and paving equipment, plus emissions from a dump truck hauling pavement materials to the site. Estimated emissions that would occur from construction, demolition, grading, paving, and painting activities under Option A are presented in Table 3.4-5. The emissions shown would occur over the duration of the construction period.

Table 3.4-5. Construction Emissions – Option A

Source	Emissions (In Tons)					
	CO	*VOC*	*NO_x*	*SO_x*	*PM_{10}*	*$PM_{2.5}$*
Construction & Demolition	32.9	10.3	151.1	0.0	10.7	10.7
Grading/Trenching	5.8	1.0	8.2	0.8	1.9	1.9
New Pavement	14.5	3.0	32.2	2.6	2.3	2.3
Total	**53.2**	**14.3**	**191.5**	**3.4**	**14.9**	**14.9**

CO = carbon monoxide; VOC = volatile organic compound; NO_x = nitrogen oxides; SO_x = sulfur oxides; PM_{10} = particulate matter less than or equal to 10 micrometers in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 micrometers in diameter

Emissions generated by construction, demolition, and paving projects are temporary in nature and would end when construction is complete. The emissions from fugitive dust (PM_{10}) would be considerably less than those presented in Table 3.4-5 due to the implementation of control measures in accordance with standard construction practices. For instance, frequent spraying of water on exposed soil during construction, proper soil stockpiling methods, and prompt replacement of ground cover or pavement are standard landscaping procedures that could be used to minimize the amount of dust generated during construction. Using efficient practices and avoiding long periods where engines are running at idle may reduce combustion emissions from construction equipment. Vehicular combustion emissions from construction worker commuting may be reduced by carpooling.

In general, combustive and fugitive dust emissions would produce localized, short-term elevated air pollutant concentrations, which would not result in any long-term impacts on the air quality in the Anchorage region and AQCR 8. The temporary construction-related emissions of PM_{10} and sulfur oxides (SO_x) are not expected to adversely impact the air quality or visibility.

Operational Emissions. Air emissions after Option A is completed are expected to be slightly less than current operations, due to utilities such as boilers, heaters, emergency generators, and maintenance activities being included with the new facilities. The new utility equipment would be more efficient and have lower air pollutant emissions than older boilers and heaters at the base. Similarly, new fuel transfer and vehicle maintenance facilities would be constructed with modern equipment designed to minimize air emissions.

Air emissions from stationary and ground-based sources related to aircraft maintenance, including aerospace ground equipment, engine test cells, chemical usage, degreasing, and painting are expected to decrease relative to baseline emissions due to the lower maintenance requirements of the F-22A as compared to the F-15C or F-15E.

The installation or modification of any air emission sources, such as boiler and heaters, emergency generators, corrosion control, etc., would need to be evaluated on an individual basis with regards to the Title V permits and stationary source regulations applicable to the base.

Aircraft Emissions. In addition to the facilities that would be added under Option A, the emissions from aircraft operations at the base, including landings and take-offs, touch-and-goes, and low approaches, would change due to the replacement of the F-15C and F-15E aircraft with

the new F-22A aircraft. As the aircraft operations for the F-22A would be roughly equivalent to those currently employed by the F-15C and F-15E aircraft, the differences in emissions could be predicted from the differences in engine characteristics between the incoming and outgoing aircraft. Such qualitative comparison could also be applied to sorties being flown in Alaskan airspace. Aircraft emission factors are available in O'Brien and Wade (2002) and Wade (2002) for the F-15C, F-15E, and F-22A aircraft. The F-22A consumes more fuel per hour of flying time than either the F-15C or F-15E, thus increasing emissions of most pollutants. The higher efficiency of the engine in the F-22A, however, results in lower emissions of VOCs for this aircraft. For the other criteria pollutants, emissions from an F-22A would be higher than those from an F-15 aircraft. The effects of any emissions increase per aircraft would be offset by the reduced number of aircraft and the higher flight altitudes employed by the F-22A aircraft, as shown in Table 2.2-3, which would lead to greater dispersion of the pollutants at the higher altitudes. It is expected that these changes in emissions due to Option A would not result in any impacts on the air quality of the Anchorage area or AQCR 8.

Indirect Emissions. After construction, Option A would result in a decrease of employees commuting to and from the base, which would result in a corresponding decrease in air pollutant emissions from personally owned commuting vehicles.

3.4.3.2 Option B

Option B would involve the same change in assigned aircraft as in Option A, and similar associated construction, demolition, grading, and paving projects, as detailed in Table 2.1-5.

Construction Emissions. Emissions during the construction period were quantified as for Option A. Estimated emissions that would occur from construction, demolition, grading, paving, and painting activities under Option B are presented in Table 3.4-6. The emissions shown would occur over the duration of the construction period.

Table 3.4-6. Construction Emissions – Option B

Source	**Emissions (in Tons)**					
	CO	***VOC***	***NO_x***	***SO_x***	***PM_{10}***	***$PM_{2.5}$***
Construction & Demolition	26.4	8.3	121.6	0.0	8.6	8.6
Grading/Trenching	5.8	1.0	8.2	0.8	1.6	1.6
New Pavement	12.3	2.6	26.8	2.1	1.9	1.9
Total	**44.5**	**11.9**	**156.6**	**2.9**	**12.1**	**12.1**

CO = carbon monoxide; VOC = volatile organic compound; NO_x = nitrogen oxides; SO_x = sulfur oxides; PM_{10} = particulate matter less than or equal to 10 micrometers in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 micrometers in diameter

In general, combustive and fugitive dust emissions would produce localized, short-term elevated air pollutant concentrations, which would not result in any long-term impacts on the air quality in the Anchorage region and AQCR 8. The temporary construction-related emissions of PM_{10} and SO_x are not expected to adversely impact the air quality or visibility in any PSD Class I area.

Operational Emissions. As for Option A, the air emissions after Option B is completed are expected to be slightly less than current operations, due to utilities such as boilers, heaters, emergency generators, and maintenance activities being included with the new facilities. New

utility equipment would be more efficient and have lower air pollutant emissions than older boilers and heaters at the base. Similarly, new fuel transfer and vehicle maintenance facilities would be constructed with modern equipment designed to minimize air emissions from stationary and ground-based sources.

Aircraft Emissions. Base aircraft operations would be the same under Option B as under Option A. Changes in aircraft emissions due to Option B would not result in any impacts on the air quality of the Anchorage area or AQCR 8.

Indirect Emissions. Implementation of Option B would also result in the long run decrease of employees commuting to and from the base, which would result in a corresponding decrease in air pollutant emissions from personally owned vehicles.

3.4.3.3 Option C

Option C would involve the same change in assigned aircraft as in Option A, and similar associated construction, demolition, grading, and paving projects, as detailed in Table 2.1-5.

Construction Emissions. Emissions during the construction period were quantified as for Option A. Estimated emissions that would occur from construction, demolition, grading, paving, and painting activities under Option C are presented in Table 3.4-7. The emissions shown would occur over the duration of the construction period.

Table 3.4-7. Construction Emissions – Option C

	Emissions (in tons)					
Source	*CO*	*VOC*	*NO_x*	*SO_x*	*PM_{10}*	*$PM_{2.5}$*
Construction & Demolition	32.9	10.3	151.1	0.0	10.7	10.7
Grading/Trenching	5.8	1.0	8.2	0.8	1.7	1.7
New Pavement	12.3	2.6	26.8	2.1	1.9	1.9
Total	**51.0**	**13.9**	**186.1**	**2.9**	**14.3**	**14.3**

CO = carbon monoxide; VOC = volatile organic compound; NO_x = nitrogen oxides; SO_x = sulfur oxides; PM_{10} = particulate matter less than or equal to 10 micrometers in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 micrometers in diameter

In general, combustive and fugitive dust emissions would produce localized, short-term elevated air pollutant concentrations, which would not result in any long-term impacts on the air quality in the Anchorage region and AQCR 8. The temporary construction-related emissions of PM_{10} and SO_x are not expected to adversely impact the air quality or visibility in any PSD Class I area.

Operational Emissions. As for Option A, the air emissions after Option C is completed are expected to be slightly less than current operations, due to utilities such as boilers, heaters, emergency generators, and maintenance activities. New utility equipment and fuel transfer would be more efficient and have lower air pollutant emissions than older boilers and heaters at the base. Air emissions from stationary and ground-based sources related to aircraft maintenance are expected to decrease relative to baseline emissions due to the lower maintenance requirements of the F-22A fleet.

Aircraft Emissions. Aircraft operations at the base would be the same under Option C as under Option A. It is expected that the changes in aircraft emissions due to Option C would not result in any long-term impacts on the air quality of the Anchorage area or AQCR 8.

Indirect Emissions. As with Option A, implementation of Option C would result in a decrease of employees commuting to and from the base, which would result in a corresponding decrease in air pollutant emissions from personally owned vehicles commuting to and from the base.

3.4.3.4 No Action

Under the No Action Alternative, no construction emissions would occur and operational emissions would be identical to current baseline.

3.5 Physical Resources

3.5.1 Definition of Elmendorf AFB Physical Resources

Physical resources consist of earth and water resources and hazardous materials and waste management. Hazardous materials are identified and regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); the Occupational Safety and Health Administration; and the Emergency Planning and Community Right-to-Know Act. Hazardous materials have been defined in AFI 32-7086, *Hazardous Materials Management*, to include any substance with special characteristics that could harm people, plants, or animals. Hazardous waste is defined in the Resource Conservation and Recovery Act as any solid, liquid, contained gaseous or semisolid waste, or any combination of wastes that could or do pose a substantial hazard to human health or the environment. Waste may be classified as hazardous because of its toxicity, reactivity, ignitibility, or corrosivity. In addition, certain types of waste are "listed" or identified as hazardous in 40 CFR 263. The ROI for this resource is defined as Elmendorf AFB.

3.5.2 Existing Conditions

3.5.2.1 Earth Resources

Earth resources include the geology, soils, and topography of Elmendorf AFB. The principal geologic factors influencing stability of structures are soil stability and seismic properties. Soil, in general, refers to unconsolidated earthen materials overlying bedrock or other parent material. Soil structure, elasticity, strength, shrink-swell potential, and erodibility all determine the ability for the ground to support structures and facilities. Relative to development, soils typically are described in terms of their type, slope, physical characteristics, and relative compatibility or limitations with regard to particular construction activities and types of land use. Long-term geological, erosional, and depositional processes typically influence the topographic relief of an area.

The bedrock beneath Elmendorf AFB consists of Tertiary clastic sedimentary rocks, which to the east form a wedge overlying Mesozoic metamorphic rocks of the Chugach Mountains. Glacial and related deposits, including terminal moraines, ground moraines, and glacial outwash plains, dominate regional landforms on Elmendorf AFB and in the Anchorage area. The most distinctive landform at Elmendorf AFB is the Elmendorf Moraine, a southwest-northeast trending terminal moraine. The moraine consists of horizontally and vertically discontinuous, unconsolidated glacial till with poorly sorted boulders, gravel, sand and silt deposits. Finer-grained clay lens deposits are found throughout the moraine and may result in zones of

perched groundwater. The southern boundary of the moraine is visible as a rising bluff line along the north side of Elmendorf's east-west runway. Moraine elevations range from 200 to 300 feet MSL.

South of the Elmendorf Moraine lies the glacial outwash plain alluvium. The alluvium deposits were formed by a series of coalescing streams resulting from glacial melt water. These outwash plain deposits consist of unconsolidated fine- to medium-grained, poorly sorted sand and gravel. Elevations range from 100 to 225 feet MSL. Relief is mostly flat, and slopes gently to the south-southwest. Most of the developed areas on the base have been built in the outwash plain alluvium. Over 90 percent of the contaminated sites are located in this area.

Underlying glacial moraine and outwash deposits are the shallow marine deposits of the Bootlegger Cove formation. The Bootlegger Cove formation is a fine-grained glacioestuarine deposit consisting of silt and clay. Depth to the Bootlegger Cove formation ranges from 1 to 60 feet below ground surface near the moraine and from 75 to 100 feet below ground surface throughout the outwash plain. Overall, the formation is thought to be at least 125 feet thick and may be more than 250 feet thick in certain locations.

Soils at Elmendorf AFB and the surrounding area are dominated by three types of unconsolidated deposits: coarse-grained, fine-grained, and till. Based on grain size and moisture content, these soil types likely have low to moderate potential for erosion by water or wind. The runway area at Elmendorf AFB is underlain by surficial zones of sand and gravel deposited as either glacial outwash or alluvium along stream channels. The sand and gravel is typically well drained, high in strength, low in compressibility, nonfrost susceptible, and an excellent foundation material.

Elmendorf AFB is located in an area that is seismically active and has also been affected by volcanic eruptions of Mount Spurr, Mount St. Augustine, and Mount Redoubt. The Mount St. Augustine volcanic eruption in January 2006 threatened the Anchorage area with ash deposition. Two earthquake faults border the Anchorage area. The Border Ranges Fault bisects the area east of Elmendorf AFB and a second fault runs in the Chugach Mountains. Elmendorf AFB lies in a tectonic basin bounded by the Bruin Bay-Castle Mountain fault system to the west and the Denali fault system to the north. This is an active tectonic setting, with seismic events along both fault systems as well as the underlying Benioff Zone. This zone results from subduction forces pushing the Pacific tectonic plate beneath the North American plate. Intermediate to shallow seismic incidents related to the fault systems, as well as deeper events associated with the subduction, are common. The 1964 earthquake triggered numerous landslides in the Anchorage area, including nearby areas along the Knik Arm. The sliding was attributed both to failures in sensitive clays and the liquefaction of the sandy layers in the upper portions of Bootlegger Cove Formation and to the unusually long duration of the earthquake.

3.5.2.2 Water Resources

Water resources include surface and groundwater features located within the base as well as watershed areas affected by existing and potential runoff from the base, including floodplains.

Elmendorf AFB is divided into seven resource management units based on environmental, physical, and/or social features such as watersheds, topography, land use patterns, ownership, and roads. The only unit under coastal zone management is Unit 7, Coastal Mudflats. Within this unit, there may be areas of special concern that require special management activities. The Coastal Mudflats (Unit 7) contains approximately 150 acres of shoreline that are within the

coastal zone boundary managed by Elmendorf AFB (Air Force 2004a). In addition to the Coastal Zone Management Act of 1972 (16 USC 1451 *et seq.*) as amended through the Coastal Zone Act Reauthorization Amendments of 1990 and Public Law (P.L.) 104-150, the Coastal Zone Protection Act of 1996, this unit falls under other specific regulations, including the Marine Protection, Research, and Sanctuaries Act (33 USC 1401 *et seq.*), the Marine Mammal Protection Act of 1972 (16 USC 1361 *et seq.*) as amended through 1997, and the Rivers and Harbors Act of 1899 (33 USC 403). Federal lands are excluded from coastal zone boundaries. However, all uses and activities that directly affect the coastal area must be consistent to the maximum extent practical with the Alaska Coastal Management Program and they are subject to the consistency provisions of Section 307 of the Coastal Zone Management Act of 1972, as amended (16 USC 1451 *et seq.*). The "Integrated Natural Resources Management" implementation (AFI 32-7064, Air Force 1994) directs that bases with coastal or marine properties must enter into an agreement with the Coastal American National Implementation Team to assist in the restoration and protection of coastal areas.

The Air Force has a Memorandum of Understanding with Coastal America (Coastal America 1992) to perform the following:

- Protect, preserve, and restore the nation's coastal ecosystems through existing federal capabilities and authorities.
- Collaborate and cooperate in the stewardship of coastal living resources by working together and in partnership with other federal programs.
- Provide a framework for action that effectively focuses expertise and resources on jointly identified problems to produce demonstrable environmental and programmatic results that may serve as models for effective management of coastal living resources.

The Proposed Action option locations are not within the 150 acres of shoreline that are within the coastal zone boundary managed by Elmendorf AFB.

Surface Water. The four major hydrologic systems at Elmendorf AFB, in order of decreasing size, are Ship Creek, Six-Mile Creek, EOD Creek, and the Cherry Hill Ditch. There are also a total of 12 natural and man-made lakes and ponds on the base that range in size from 1 acre to nearly 124 acres in surface area. Elmendorf AFB has 8 miles of saltwater shoreline bordering the Knik Arm of the Cook Inlet.

Ship Creek is the largest surface water drainage system on Elmendorf AFB. The Ship Creek headwaters are located within the Chugach State Park at an elevation of 5,100 feet. The stream flows west through the southern edge of Elmendorf AFB for approximately 4.2 miles and empties into the Knik Arm. The upper Ship Creek basin is an important recharge area for the deeper confined aquifer and provides approximately one quarter of total recharge to the system.

Six-Mile Creek and EOD Creek are located north of the Elmendorf Moraine. Six-Mile Creek originates as springs located near the Elmendorf AFB and Fort Richardson boundary. Cherry Hill Ditch is the major storm water drainage system for the main base area south of the Elmendorf Moraine.

The base maintains compliance with its National Pollutant Discharge Elimination System (NPDES) Multi-Sector General Permit for protection of surface water by non-point source pollutants. Surface water is also protected by measures outlined in Elmendorf AFB's Storm

Water Pollution Prevention Plan (SWPPP), which has identified potential pollutant sources and relevant BMPs to reduce the potential for pollution of receiving waters (Air Force 2005c). In addition to the Elmendorf AFB SWPPP, any new construction projects on Elmendorf AFB that would affect more than 1 acre are required to develop a project-specific SWPPP, implement BMPs, and notify the USEPA about the project.

Groundwater. Two principal groundwater aquifers have been identified in the glacial outwash plain alluvium and on the Elmendorf Moraine. These aquifers include a shallow unconfined aquifer (shallow aquifer), and a deeper confined aquifer. The Bootlegger Cove formation acts as the confining layer between the shallow and deep aquifers. In general, groundwater flow direction in the shallow aquifer matches closely that of the surface topography. Subsurface flow is to the northwest along the north limb of the moraine, and to the southeast along the south limb. The groundwater divide coincides with the crest of the moraine. The shallow aquifer on Elmendorf is not used for drinking water. This aquifer generally exists between 10 to 50 feet below ground surface.

The deeper confined aquifer is found under the entire base and generally flows in a westerly direction from the Chugach Mountains toward Knik Arm of the Cook Inlet. Groundwater from the deeper confined aquifer at Elmendorf AFB serves only as a standby drinking water supply when surface water supplies cannot meet the demand. However, the municipal area bordering Elmendorf AFB uses groundwater for various services including industrial, commercial, domestic, and public supply. Based upon groundwater monitoring data, there is contamination in portions of the shallow aquifer on-site. However, the deeper confined aquifer has not been impacted by any contaminants from sources on Elmendorf AFB. The Bootlegger Cove formation seems an effective barrier between the aquifers; there is no evidence they are interconnected.

The main source of drinking water for Elmendorf AFB is supplied by Fort Richardson. The Fort Richardson water treatment plant draws surface water from Ship Creek and filters and treats the water before it is delivered to the base through four water mains.

3.5.2.3 Hazardous Materials and Waste Management

Hazardous Materials. The majority of hazardous materials used by Air Force and contractor personnel at Elmendorf AFB are controlled through an Air Force pollution prevention process called Hazardous Materials Pharmacy (HAZMART). This process provides centralized management of the procurement, handling, storage, and issuing of hazardous materials and turn-in, recovery, reuse, or recycling of hazardous materials. The HAZMART process includes review and approval by Air Force personnel to ensure users are aware of exposure and safety risks. Pollution prevention measures are likely to minimize chemical exposure to employees, reduce potential environmental impacts, and reduce costs for material purchasing and waste disposal.

Hazardous Waste Management. Elmendorf AFB is a large-quantity hazardous waste generator. Hazardous wastes generated during operations and maintenance activities include combustible solvents from parts washers, inorganic paint chips from lead abatement projects, fuel filters, metal-contaminated spent acids from aircraft corrosion control, painting wastes, battery acid, spent x-ray fixer, corrosive liquids from boiler operations, toxic sludge from washracks, aviation fuel from tank cleanouts, and pesticides.

Hazardous wastes are managed in accordance with the Elmendorf AFB OPlan 19-3. Hazardous wastes are initially stored at approximately 50 satellite accumulation areas. Satellite accumulation areas allow for the accumulation of up to 55 gallons of hazardous waste (or one quart of an acute hazardous waste) to be stored at or near the point of waste generation. There are two 90-day waste accumulation sites on Elmendorf AFB located at 4314 Kenney Avenue and 11735 Vandenberg Avenue. The base is identified by USEPA identification number AK8570028649. In FY 2005, 56,568 pounds of hazardous waste were removed from Elmendorf AFB and disposed of in off base permitted disposal facilities.

The Elmendorf AFB Spill Prevention Control and Countermeasures Plan addresses on-base storage locations and proper handling procedures of all hazardous materials to minimize potential spills and releases. The plan further outlines activities to be undertaken to minimize the adverse effects of a spill, including notification, containment, decontamination, and cleanup of spilled materials.

The Elmendorf AFB Asbestos Management Plan provides guidance on the management of asbestos. An asbestos facility register is maintained by Civil Engineering. Persons inspecting, designing, or conducting asbestos response actions in public or commercial buildings must be properly trained and accredited through an applicable asbestos training program. The design of building alteration projects and requests for self-help projects are reviewed to determine if asbestos contaminated materials are present in the proposed work area and, if so, are disposed of in an off base permitted landfill.

Environmental Restoration Program (ERP). The DoD developed the ERP to identify, investigate, and remediate potentially hazardous material disposal sites on DoD property prior to 1984. In August 1990, Elmendorf AFB was placed on the National Priorities List bringing it under the federal facility provisions of CERCLA Section 120. Currently the Air Force has identified 85 sources of contamination from operations that occurred prior to 1984. These sources have been placed into three groups: CERCLA sources (40 sources), state program sources (40 sources) and Resource Conservation and Recovery Act sources (5 sources) (Air Force 2003a).

Sources that are in close proximity to facilities that may be renovated or where new construction is potentially considered by the beddown of the F-22A include CERCLA sources SS-22, SD-28 and SD-29 and three state program sources ST-34, ST-48, and ST-67. The proposed location of the Fire Crash Station could be affected by results of a remedial investigation/feasibility study of ERP site SS-22.

ERP site SS-22 is located east of the Defense Reutilization and Marketing Office (DRMO) storage facility. After being closed with a no further remedial action plan in 1991, the site was reopened as a result of discovery of buried debris encompassing 22 acres and tar seeps in two separate areas in 2002. A remedial investigation/feasibility study programmed for FY 07.

ERP site SD-28 is located in Building 16710 which was used as a wash rack for ground refueling equipment. Wash and rinse waters, containing a petroleum-based solvent used for parts degreasing, drained into a dry well for a period of time prior to the wash rack being connected to the sanitary sewer.

ERP site SD-29 is located near Building 16716 between Taxiway F and Talley Way. The primary source of contamination is thought to be from hazardous materials associated with aircraft maintenance activities disposed down floor drains that flowed into dry wells. The primary

contaminants of concern for groundwater include tetrachoroethylene and trichloroethylene. In 1994, soil investigations noted that soil contamination did not exceed regulatory limits.

Both ERP site SD-28 and 29 are components of Operable Unit 4 and the Record of Decision was signed in September 1995. The selected remedy includes land use controls which prohibit the use of the shallow aquifer until cleanup goals are achieved and groundwater monitoring to evaluate contaminant migration and timely reduction of contaminant concentrations by natural attenuation (Air Force 2004c).

ERP site ST-34 is a former Army-Air Force Exchange Services gas station that had a fuel release in 1991 from one of the feed lines. The underground storage tanks and associated piping and contaminated soils were removed. The site (ST-506/9) is currently managed under the state program.

ERP site ST-48 is located north of Building 10571, also known as Hangar 3. A pipeline leak in 1968 resulted in a release of approximately 700-800 gallons of diesel fuel. None of the fuel was recovered and site investigations identified elevated levels of total petroleum hydrocarbons and polycyclic aromatic hydrocarbons in the soil. An asphalt parking lot was installed over the contaminated area, limiting contact with the contaminated soils. This State Program site is currently being monitored under the Basewide Groundwater Program (Air Force 2004d).

ERP site ST-67 is located east of Heritage Circle at Building 9569. A regulated underground storage tank storing diesel fuel failed a tank tightness test and was taken out of service in 1992. The site was closed in October 1994 (Air Force 2004d)

Monitoring wells are located within or near ERP site SD-28, SD-29, and ST-34 and their locations will need to be considered as project siting for the beddown of the F-22A is evaluated.

3.5.3 Environmental Consequences

3.5.3.1 Option A

Earth Resources. Construction of the F-22A facilities to support Option A would disturb approximately 50 acres in an area that was previously disturbed with the initial construction of the base. Approximately 30 acres consist of 50 to 60 year old second growth timber. The area east of the north-south runway is generally flat with some improvements and road corridors. The ground surface would be cleared of existing vegetation, graded and prepared for the installation of subsurface utilities and building foundations. All facilities would be designed and constructed to meet seismic design standards for the base. Since more than 1 acre would be disturbed by construction, a construction NPDES storm water permit would be required. Under the permit, the base must develop a site-specific SWPPP that describes BMPs to be implemented to eliminate or reduce sediment and non-storm water discharges. With proper design and implementation of the SWPPP, impacts from erosion and off-site sedimentation would be negligible.

Water Resources. Construction of the facilities that would support the beddown of the F-22A under this option would generate storm water runoff from the construction for a four-year time span. Runoff from these construction areas could contain contaminants that would degrade the quality of receiving waters. Once the facilities are constructed storm water from the new impervious surfaces would be directed to open areas by sheet flow or swales for percolation in to the shallow aquifer.

The overall Elmendorf AFB SWPPP identifies erosion control practices to be followed for exposed soil surfaces. These standard erosion control practices include the use of mulch or

artificial cover where repeated disturbance is expected and stabilization of soil within 30 days of final disturbance through vegetative or permanent artificial means (e.g., paving or rip-rapping). With adherence to BMPs, adverse effects from erosion would be avoided.

The Air Force would ensure that construction activities are conducted in accordance with the applicable storm water discharge permit for any areas that result in soil disturbance. Site-specific management plans and BMPs would be implemented to control erosion and prevent sediment, debris or other pollutants from entering storm water during site activities.

Once facility construction is completed and operations commence, the base's SWPPP also specifies procedures for spill prevention and response, routine inspection of discharges at sites, and proper training of employees. With implementation of BMPs, impacts to surface water quality at Elmendorf AFB would not be considered significant.

Option A is not within the 150 acres of shoreline that are within the coastal zone boundary managed by Elmendorf AFB, no impacts to coastal areas would be expected as a result of the Proposed Action.

Hazardous Materials. Existing procedures for the centralized management of the procurement, handling, storage, and issuing of hazardous materials through the HAZMART are adequate to handle the changes anticipated with the beddown of the F-22A, but would be expanded to meet the increased use. Construction of the F-22A facilities may require the use of hazardous materials by contractor personnel. Project contractors would comply with federal, state, and local environmental laws and would employ affirmative procurement practices when economically and technically feasible.

All hazardous materials and construction debris generated by the proposed project would be handled, stored, and disposed of in accordance with federal state and local regulations and laws. Permits for handling and disposal of hazardous material would be coordinated by the contractor with the base hazardous waste program manager. The use of hazardous materials would not cause adverse impacts.

In the event of fuel spillage during demolition or construction, the contractor would be responsible for its containment, clean up, and related disposal costs. The contractor would have sufficient spill supplies readily available on the pumping vehicle and/or at the site to contain any spillage. In the event of a contractor related release, the contractor would immediately notify the 3 WG Civil Engineering/Environmental Flight and take appropriate actions to correct its cause and prevent future occurrences.

Hazardous Waste. Elmendorf AFB would continue to generate hazardous wastes during various operations and maintenance activities. Hazardous waste disposal procedures, including off base disposal procedures, are adequate to handle changes in quantity and would remain the same. The base's OPlan 19-3 would be updated to reflect any changes of hazardous waste generators and waste accumulation point monitors. The number of hazardous waste accumulation sites would be modified to handle the change in waste generation and there would be no adverse impacts. In the event that any hazardous wastes are generated as a result of F-22A maintenance activities that present any unique hazards over those generated by the F-15C and F-15Es, Elmendorf AFB would implement appropriate hazardous waste control procedures to minimize potential risks to personnel and the environment.

The stealth coatings of the F-22A require special treatment. Low observability composite repair facilities are proposed for construction as part of the F-22A facilities at Elmendorf. These

facilities provide engineering and environmental controls whereby any hazardous materials associated with the composite materials used by the F-22A can be isolated from the air and water environments for safe disposition.

Environmental Restoration Program. Construction of facilities under Option A would have only one contaminated site near the proposed construction associated with FTE. ERP Site ST-34, the former Army-Air Force Exchange Services gas station located along Vandenberg Drive, is on the edge of the proposed construction for FTE, but not within the construction footprint of any F-22A related construction activity. This site is managed now under the state program and this option would not be expected to result in interference with ongoing remediation activities on Elmendorf AFB. It is unlikely that any activities associated with construction activities would impact the site because the ERP site is not directly located within the construction zone. As noted in Section 3.5.2.3, the siting of the Fire Crash Station could be adjusted following evaluation of ERP site SS-22. There would be the potential to have contaminated soil under the currently proposed Fire Crash Station site.

The Air Force will coordinate with the restoration office before any construction work is initiated. The Air Force will ensure that construction activities are coordinated with ongoing remediation or investigation activities at any CERCLA site.

3.5.3.2 Option B

Earth and Water Resources. Construction of the F-22A facilities to support Option B would disturb approximately 40 acres in an area that was previously disturbed with the initial construction of the base, of which approximately 20 acres consist of second growth trees. Disturbed areas would be approximately 20 percent less than under Option A. The area to be disturbed would include approximately 36 acres east of the north-south runway that is generally flat with some improvements and road corridors. The ground surface would be cleared of existing vegetation, graded, and prepared for the installation of subsurface utilities and building foundations. An additional site would be developed near buildings 16670 and 15658 for flow-through aircraft weather shelters. All facilities would be designed and constructed to meet seismic design standards for the base. Option B is not within the 150 acres of shoreline that are within the coastal zone boundary managed by Elmendorf AFB, no impacts to coastal areas would be expected as a result of the Proposed Action.

Since more than 1 acre would be disturbed by construction, a construction NPDES storm water permit would be required. An SWPPP, comparable to the one noted under Option A, would describe BMPs to be implemented to eliminate or reduce sediment and non-storm water discharges. As with Option A, Option B would have negligible effects from erosion or off-site sedimentation. Site-specific management plans and BMPs would be implemented to control erosion and prevent sediment, debris, or other pollutants from entering storm water during site activities.

Hazardous Materials, Hazardous Waste, and the Environmental Restoration Program. Option B would not result in any different consequences to hazardous materials, hazardous wastes, or implementing the base ERP than those described for Option A. Option B includes construction of facilities to treat and maintain the composites and materials used to preserve stealth characteristics for the F-22A.

3.5.3.3 Option C

Earth and Water Resources. Construction of the F-22A facilities to support Option C would disturb approximately 30 acres in an area that was previously disturbed with the initial construction of the base. Approximately 10 acres consist of second growth trees. The area east of the north-south runway is generally flat with some improvements and road corridors. The ground surface would be cleared of existing vegetation, graded, and prepared for the installation of subsurface utilities and building foundations. Under this option, there would be increased use of existing facilities and the largest number of renovated facilities. All facilities would be designed and constructed to meet seismic design standards for the base. Option C is not within the 150 acres of shoreline that are within the coastal zone boundary managed by Elmendorf AFB, no impacts to coastal areas would be expected as a result of the Proposed Action. Since more than 1 acre would be disturbed by construction, a construction NPDES storm water permit would be required. The Option C SWPPP would describe BMPs to be implemented to eliminate or reduce sediment and non-storm water discharges. Consequences would be essentially the same as those discussed for Option A.

Hazardous Materials, Hazardous Waste, and the Environmental Restoration Program. Option C would not result in any different consequences to hazardous materials, hazardous wastes, or implementing the base ERP. Option C includes construction of facilities to treat and maintain the composites and materials used to preserve stealth characteristics for the F-22A. As with Options A and B, no significant impacts to physical resources would be expected to result from F-22A construction or operation at Elmendorf AFB.

3.5.3.4 No Action

No Action would mean no F-22A beddown at Elmendorf AFB. No additional construction supporting the F-22A program would occur and no ground disturbing activities would take place. Aircraft maintenance activities, generating hazardous waste, would continue to support the existing F-15C and F-15E squadrons and the other aircraft stationed at Elmendorf AFB.

3.6 Biological Resources

3.6.1 Definition of Elmendorf AFB Biological Resources

Biological resources in this discussion refers to plants and animals and the habitats in which they occur on and within the environs of Elmendorf AFB. Assemblages of plant and animal species within a defined area that are linked by ecological processes are referred to as natural communities. The existence and preservation of these resources are intrinsically valuable; they also provide aesthetic, recreational, and socioeconomic values to society. This section focuses on plant and animal species or vegetation types associated with Elmendorf AFB that typify or are important to the function of the ecosystem, are of special societal importance, or are protected under federal or state law or statute. For purposes of the analysis, Elmendorf and neighboring biological resources will be organized into three major categories: (1) vegetation and habitat, including wetlands; (2) fish and wildlife; and (3) special-status species.

Federal laws and regulations that apply to biological resources include: Fish and Wildlife Coordination Act, Migratory Bird Treaty Act, Clean Water Act, NEPA, Federal Land Policy and Management Act, Endangered Species Act (ESA), Sikes Act, Marine Mammal Protection Act, state hunting regulations, and state laws protecting plants and nongame wildlife.

In this section the ROI for biological resources is Elmendorf AFB and its immediate vicinity. Specifically, effects to biological resources will focus on the footprint for construction activities

proposed under each option and any potential for construction or operation of F-22A facilities to impact biological resources.

Vegetation includes all existing terrestrial plant communities, but excludes discussion of special-status plants, which are discussed under special-status species below. The composition of plant species within a given area defines ecological communities and determines the types of wildlife that may be present. Wetlands are a special category of sensitive habitats and are subject to regulatory authority under Section 404 of the Clean Water Act, Executive Order (EO) 11990 *Protection of Wetlands*, and EO 19988 *Floodplain Management*. The USACE administers the Clean Water Act, and has jurisdiction over all waters of the U.S., including wetlands. Jurisdictional wetlands are those areas that meet all the criteria defined in the USACE's *Wetlands Delineation Manual* (Environmental Laboratory 1987).

Fish and wildlife includes all vertebrate animals with the exception of special-status species, which are discussed separately. Typical animals include vertebrate groups such as fish, amphibians, songbirds, waterfowl, hoofed animals, carnivores, bats, rodents and other small mammals. The attributes and quality of available habitats determine the composition, diversity, and abundance patterns of wildlife species assemblages, or communities. Each species has its own set of habitat requirements and interspecific interactions driving its observed distribution and abundance. Community structure is derived from the net effect of the diverse resource and habitat requirements of each species within a geographic setting. For this reason, an assessment of habitat types and area affected by the Proposed Action can serve as an overriding determinant in the assessment of impacts for wildlife populations.

Special-status species are defined as those plant and animal species listed as threatened, endangered, candidate, or species of concern by the United States Fish and Wildlife Service (USFWS) or the National Marine Fisheries Service, as well as those species with special-status designations by the state of Alaska. The ESA protects federally listed threatened and endangered plant and animal species. Candidate species are species that USFWS is considering for listing as threatened or endangered but for which a proposed rule has not yet been developed. Candidates do not benefit from legal protection under the ESA. In some instances, candidate species may be emergency listed if USFWS determines that the species population is at risk due to a potential or imminent impact. The USFWS encourages federal agencies to consider candidate species in their planning process because they may be listed in the future and, more importantly, because current actions may prevent future listing. Species of concern are species for which data were inconclusive to support ESA protection at the time of the proposed listing. It is an informal designation, although USFWS recommends tracking of population trends and threats. The Alaska Department of Fish and Game also maintains a list of endangered species and species of special concern.

3.6.2 Existing Conditions

Vegetation. Elmendorf AFB is situated across rolling upland plains near the head of Cook Inlet (Knik Arm) in southcentral Alaska within the Coastal Trough Humid Taiga Province (Bailey 1995). The area is characterized by spruce-hardwood forests, bottomlands of spruce-poplar forests along major drainages, and dense stands of alder and willow along riparian corridors. Wet tundra communities bracket the coast. Approximately 4,202 acres of Elmendorf AFB's 13,455 acres are disturbed or cleared for base facilities (Air Force 2000).

There are 1,534 acres of wetlands at Elmendorf AFB (Air Force 2000). Wetland types are varied and range from palustrine scrub-shrub and forested wetlands to lacustrine and estuarine wetlands.

Fish and Wildlife. Elmendorf AFB supports a diverse array of wildlife species, including large and small mammals, raptors, waterfowl, songbirds, and fish. Due to the northerly latitude of the base, no reptiles occur, while the wood frog (*Rana sylvatica*) is the only amphibian species.

Moose (*Alces alces*), black bears (*Ursus americanus*), brown bears (*u. arctos*), and wolves (*Canis lupus*) are prevalent on the base and are typical residents of the Alaskan environment. These species have large home ranges which also includes the neighboring Fort Richardson and Chugach State Park. Between 20 and 70 moose are estimated by Alaska Fish and Game to live on Elmendorf AFB, depending on the time of year, as portions of the herd migrate off base in fall and winter. Twelve to 24 black bears occur in summer, while 6 to 12 of these will spend the winter in dens on the base. Three to 6 brown bears inhabit Elmendorf AFB in summer. Two wolf packs roam the lands of Elmendorf AFB and Fort Richardson (Air Force 2000). Coyotes (*Canis latrans*) are also common. Lynx (*Lynx canadensis*) and red fox (*Vulpes vulpes*) also occur.

Elmendorf AFB also supports populations of small mammals including beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), porcupine (*Erethizon dorsatum*), red squirrel *(Tamiasciurus hudsonicus*),snowshoe hare (*Lepus americanus*), river otter (*Lutra canadensis*), short-tailed weasel (*Mustela erminea*), and mink (*M. vison*).

At least 112 bird species are known to occur or have the potential to occur at Elmendorf AFB (Air Force 2000). Waterfowl and shorebirds use the base's ponds, bogs, wetlands, and coastal marshes in summer and on spring and fall migration. Raptors include osprey (*Pandion haliaetus*), red-tailed hawk (*Buteo jamaicensis*), rough-legged hawk (*B. lagopus*), sharp-shinned hawk (*Accipiter striatus*), northern goshawk (*A. gentils*), merlin (*Falco columbarius*), northern harrier (*Circus cyaneus*), northern saw-whet owl (*Aegolius acadius*), boreal owl (*A. funereus*), and great horned owl (*Bubo virginianus*). Bald eagles (*Haliaeetus leucocephalus*), currently listed as federally threatened in the lower 48 states, also reside on the base. Common breeding birds include alder flycatcher (*Empidonax alnorum),* boreal chickadee (*Poecile hudsonica*), black-capped chickadee (*P. atricapillus*), gray jay (*Perisoreus Canadensis*), Swainson's thrush (*Catharus ustulatus*), myrtle warbler (*Dendroica coronata*), American robin (*Turdus migraterius*), slate-colored junco (*Junco hyemalis*), ruby-crowned kinglet (*Regulus calendula*), and white-winged crossbill (*Loxia leucoptera*).

Ten fish species occur at Elmendorf AFB, including the five Pacific salmon species (Air Force 2000). Ship Creek and Six-Mile Creek are the main spawning creeks for these anadromous fish on the base.

Ship Creek is an important urban salmon fishery.

Special-Status Species. There are no federally listed threatened or endangered species that inhabit Elmendorf AFB (Table 3.6-1). Six Alaska species of special concern may occur on or near the base. These are olive-sided flycatcher (*Contopus borealis*), blackpoll warbler (*Dendroica striata*), peregrine falcon (*Falco peregrinus*), gray-cheeked thrush (*Catharus minimus*), Townsend's warbler (*Dendroica townsendi*), and beluga whale (*Delphinapterus leucas*). The olive-sided flycatcher and blackpoll warbler are known nesting species on the base (Air Force 2000). Both species are found in coniferous forests, with the flycatcher preferring more open forests (Ehrlich *et al.* 1988).

Table 3.6-1. The Relationship of Special-Status Species to Elmendorf AFB and Environs

Common Name	*Scientific Name*	*Status*	*Occurrence at Elmendorf AFB*
Aleutian shield fern	*Polystichum aleuticum*	FE	No
Chinook salmon (Fall stock from Snake River)	*Oncorhynchus tshawytscha*	AK SSC	No
Leatherback sea turtle	*Dermochelys coriacea*	FE	No
Short-tailed albatross	*Phoebastria albatrus*	FE, AKE	No
Kittlitz's murrelet	*Brachyramphus brevirostris*	FC	No
Eskimo curlew	*Numenius borealis*	FE, AKE	No
Spectacled eider	*Somateria fisheri*	FT, AK SSC	No
Stellar's eider (AK breeding population)	*Polysticta stelleri*	FT, AK SSC	No
Aleutian Canada goose	*Branta canadensis leucopareia*	AK SSC	No
Peregrine falcon	*Falco peregrinus*	AK SSC	Potential Migrant
Northern goshawk (southeast AK population)	*Accipiter gentilis laingi*	AK SSC	No
Olive-sided flycatcher	*Contopus cooperi*	AK SSC	Yes
Gray-cheeked thrush	*Catharus minimus*	AK SSC	Migrant
Townsend's warbler	*Dendroica townsendi*	AK SSC	Potential
Blackpoll warbler	*Dendroica striata*	AK SSC	Yes
Brown bear (Kenai Peninsula population)	*Ursus arctos horribilis*	AK SSC	No
Sea otter (southwest Alaska distinct population segment)	*Enhydra lutris kenyoni*	FT, AK SSC	No
Harbor seal	*Phoca vitulina*	AK SSC	No
Stellar sea-lion	*Eumetopias jubatus*	FT=eastern population, FE=western population AK SSC	No
Bowhead whale	*Balaena mysticetus*	FE, AK SSC	No
Finback whale	*Balaenoptera physalus*	FE	No
Humpback whale	*Megaptera novaeangliae*	FE, AKE	No
Right whale	*Eubalaena glacialis*	AKE	No
Blue whale	*Balaenoptera musculus*	AKE	No
Beluga whale (Cook Inlet population)	*Delphinapterus leucas*	AK SSC	No, but occur in adjacent waters that may be affected by base noise contours

FE = Federal Endangered; FT = Federal Threatened; FC = Federal Candidate; AKE = State of Alaska Endangered; AK SSC = State of Alaska Species of Special Concern.
Sources: Alaska Department of Fish and Game 2005a and 2005b, USFWS 2005.

Peregrine falcon and gray-cheeked thrush migrate through the area and may be occasionally observed (Air Force 2000). Peregrine falcons nest on cliffs, generally over water, but these features do not occur at Elmendorf AFB. Peregrines may, however, use riparian and wetland areas on the base to hunt for prey, such as waterfowl. The gray-cheeked thrush breeds in moist coniferous forests and woodlands, arctic tundra, and riparian thickets. It is a habitat generalist on migration (Ehrlich *et al.* 1988), and therefore could occur in various habitats at Elmendorf AFB. Townsend's warbler, another coniferous forest inhabitant, may also occur on base. The Cook Inlet population of beluga whale occurs in waters adjacent to Elmendorf AFB.

3.6.3 Environmental Consequences

Four areas of consideration are used to identify the potential environmental consequences to wildlife and habitat. These areas are (1) the importance (i.e., legal, commercial, recreational, ecological, or scientific) of the resource; (2) the proportion of the resource that would be affected relative to its occurrence in the region; (3) the sensitivity of the resource to proposed activities; and (4) the duration of any ecological ramifications. Impacts to resources would be considered significant if special-status species or habitats are adversely affected over relatively large areas or disturbances cause significant reductions in population size or distribution of a special-status species (40 CFR 1508.2).

Specific concerns for biological resources within the base environs ROI are habitat loss due to construction of new facilities, noise associated with construction, and noise associated with the operation and maintenance of the F-22As at Elmendorf AFB. Concerns for species near Elmendorf AFB include noise and potential run-off to water resources from construction or operation.

3.6.3.1 Option A

Under Option A, 50 acres would be affected by construction, renovation, and infrastructure improvements in one area on the base. Approximately 60 percent of this acreage includes a stand of 50 to 60 year old second growth trees. This forest stand is composed of paper birch (*Betula papyrifera*), white spruce (*Picea glauca*), aspen (*Populus tremuloides*), and scouler willow (*Salix scouleriana*). The understory is sparse but includes highbush cranberry (*Viburnum trilobum*), sitka alder (*Alnus viridis*), prickly rose (*Rosa acicularis*), and various forbs. No wetlands would be disturbed or lost. Affected landscaped areas would be replaced following construction. Construction contracts would specify fugitive soil and dust control to prevent run-off into water resources.

Wildlife species affected by loss of forest in Option A are red squirrel and several bird species, including ruby-crowned kinglet, American robin, Swainson's thrush, slate-colored junco, myrtle warbler, orange-crowned warbler (*Vermivora celata*), and common redpoll. These species may be displaced or disturbed by construction, but would be expected to move elsewhere on the base.

Any new or new types of hazardous materials associated with F-22A stealth coatings under Option A would be prevented from reaching water resources by new facilities for maintenance of aircraft composites and coatings.

Five special-status bird species may occur at Elmendorf AFB. The peregrine falcon, gray-cheeked thrush, and Townsend's warbler would be unlikely to inhabit the developed and affected portions of Elmendorf AFB. Small numbers of olive-sided flycatcher and blackpoll

warbler may occur in the forest stand in the southeast part of the base. Clearing this marginal habitat during breeding season could disrupt some nesting birds.

Noise contours associated with the proposed operation of the F-22As at Elmendorf AFB are projected to be similar to current conditions (see Section 3.2.3). On-base species have apparently become tolerant of regular aircraft and other noise.

The noise contours extend into the Knik Arm of Cook Inlet, where beluga whales occur. Moore *et al.* (2000) reported that beluga responses to aircraft included no response and diving. Based on the literature review of noise effects on marine mammals presented in Appendix D, noise associated with Option A would not be expected to adversely affect beluga whales.

3.6.3.2 Option B

Under Option B, 40 acres in two general areas would be affected by construction, renovation, and infrastructure improvements. Some of this acreage is on lands already developed or that have otherwise been disturbed for base facilities. However, similar to Option A, some of this construction could result in the clearing of approximately 20 acres of 50 to 60 year old second growth forest in the southeast portion of the base. No wetlands would be affected.

As with Option A, some migratory bird species, including the olive-sided flycatcher and blackpoll warbler may occur in the forest stand in the southeast part of the base. As noted with Option A, the habitat is marginal for these and other migratory species.

Option B construction fugitive dust, soils erosion, and hazardous materials would be controlled to protect water resources as they would be under Option A. The somewhat different commute pattern under Option B, when compared with Option A, is not expected to affect the biological environment.

Option B noise contours would be the same as those for Option A and consequences would be the same.

3.6.3.3 Option C

Under Option C, approximately 30 acres would be affected by construction, renovation, and infrastructure improvements in three general areas of the base. Most of this acreage is on lands already developed or otherwise disturbed for base facilities. Similar to Option A, some of this construction would result in the clearing of approximately 10 acres of 50 to 60 year old second growth forest in the southeast portion of the base. No wetlands would be affected. As with Option A, some migratory bird species, including the olive-sided flycatcher and blackpoll warbler may occur in the forest stand in the southeast part of the base. As noted with Option A, the habitat is marginal for these and other migratory species. As with Option A, construction contracts would mandate fugitive dust and soils control that would protect wetlands and waterways.

Option C noise contours would be the same as those for Option A and consequences would be the same.

3.6.3.4 No Action

Under the No Action Alternative, two squadrons of F-22A would not be beddown at Elmendorf AFB. Construction of new support facilities would not occur. Mission requirements would dictate continued availability of F-15C and F-15E types of aircraft. Biological resources would not be expected to change from baseline conditions.

3.7 Cultural Resources

3.7.1 Definition of Elmendorf AFB Cultural Resources

Cultural resources are any prehistoric or historic district, site, or building, structure, or object considered important to a culture or community for scientific, traditional, religious or other purposes. They include archaeological resources, historic architectural resources, and traditional resources. The Elmendorf AFB historical setting is summarized in Appendix F. Archaeological resources are locations where prehistoric or historic activity measurably altered the earth or produced deposits of physical remains (e.g., arrowheads, bottles). Historic architectural resources include standing buildings and other structures of historic or aesthetic significance. Architectural resources generally must be more than 50 years old to be considered for inclusion in the NRHP, although resources dating to defined periods of historical significance, such as the Cold War era (1946-1990) may also be considered eligible. Traditional resources are associated with cultural practices and beliefs of a living community that are rooted in its history and are important in maintaining the continuing cultural identity of the community. Historic properties (as defined in 36 CFR 60.4) are significant archaeological, architectural, or traditional resources that are either eligible for listing, or listed in, the National Register of Historic Places (NRHP). Both historic properties and significant traditional resources identified by Alaska Natives are evaluated for potential adverse impacts from an action.

The ROI for cultural resources is the area within which an option to implement the Proposed Action could potentially affect existing cultural resources. For the Proposed Action, the ROI for cultural resources is defined as Elmendorf AFB and its environs. Cultural resources under the training airspace are discussed in Section 4.7.

3.7.2 Existing Conditions

Archaeological Resources

Since the beginning of cultural resource investigations on Elmendorf AFB in 1978, most survey work has been concentrated along the northwest border of the base property. Through these survey efforts 27 archaeological sites have been located, none of which are located within the project areas. While these sites have not been definitively evaluated for NRHP eligibility, 18 are recommended as ineligible, five are unevaluated, and four are considered potentially eligible (Air Force 2003b). Three of the four potentially eligible sites are cabin ruins associated with homesteading and the fourth, also a cabin ruin, has Alaska Native/traditional features and a possible secondary military association (Air Force 2003b). No NRHP-listed archaeological resources have been located in the project areas (Air Force 2003b; National Register Information Service [NRIS] 2006).

Architectural Resources

Elmendorf's historic structures reflect over 60 years of base contribution to national defense.

There are 48 NRHP eligible buildings or structures on Elmendorf AFB, most of which are located in one of three historic districts: the Flightline Historic District; the Alaska Air Depot Historic District; and the Generals' Quad Historic District (Figure 3.7-1). Of the historic structures outside the three historic districts, Hangar 16 (Building 15658) is located in the vicinity of EA options. Also on base are 602 unevaluated facilities constructed during the Cold War era, 365 of which are now or will turn 50 years of age by 2007 (Air Force 2003b). Elmendorf AFB has consulted with the Alaska State Historic Preservation Officer (SHPO) regarding Hangar 16 and the potential for impacts to its viewshed.

Traditional Cultural Properties and Alaska Native Concerns

Although no traditional cultural properties have yet been identified on Elmendorf AFB, neighboring Alaska Natives have raised concerns regarding the possibility of Alaska Native burials located on Elmendorf AFB property (Air Force 2003b). Ongoing consultation between the Air Force and Alaska Natives on this and other issues is conducted on a government-to-government basis. The federally recognized tribes in the Elmendorf AFB area are the Eklutna and Knik Tribes (Air Force 2003b).

3.7.3 Environmental Consequences

A number of federal regulations and guidelines have been established for the management of cultural resources. Section 106 of the National Historic Preservation Act (NHPA), as amended, requires federal agencies to take into account the effects of their undertakings on historic properties. Historic properties are cultural resources that are listed in, or eligible for listing in, the NRHP. Eligibility evaluation is the process by which resources are assessed relative to NRHP significance criteria for scientific or historic research, for the general public, and for traditional cultural groups. Under federal law, impacts to cultural resources may be considered adverse if the resources have been determined eligible for listing in the NRHP or have been identified as important to Alaska Natives as outlined in the *American Indian Religious Freedom Act* and EO 13007, *Indian Sacred Sites*. DoD Alaska Native Policy (1999) provides guidance for working with federally-recognized Alaska Native governments. DoD policy requires that installations provide timely notice to, and consult with, tribal governments prior to taking any actions that may have the potential to significantly affect protected Alaska Native resources, rights, or lands.

Analysis of potential impacts to cultural resources considers direct impacts that may occur by physically altering, damaging, or destroying all or part of a resource; altering characteristics of the surrounding environment that contribute to the resource's significance; introducing visual or audible elements that are out of character with the property or alter its setting; or neglecting the resource to the extent that it deteriorates or is destroyed. Direct impacts can be assessed by identifying the types and locations of proposed activity and determining the exact location of cultural resources that could be affected. Indirect impacts generally result from increased use of an area.

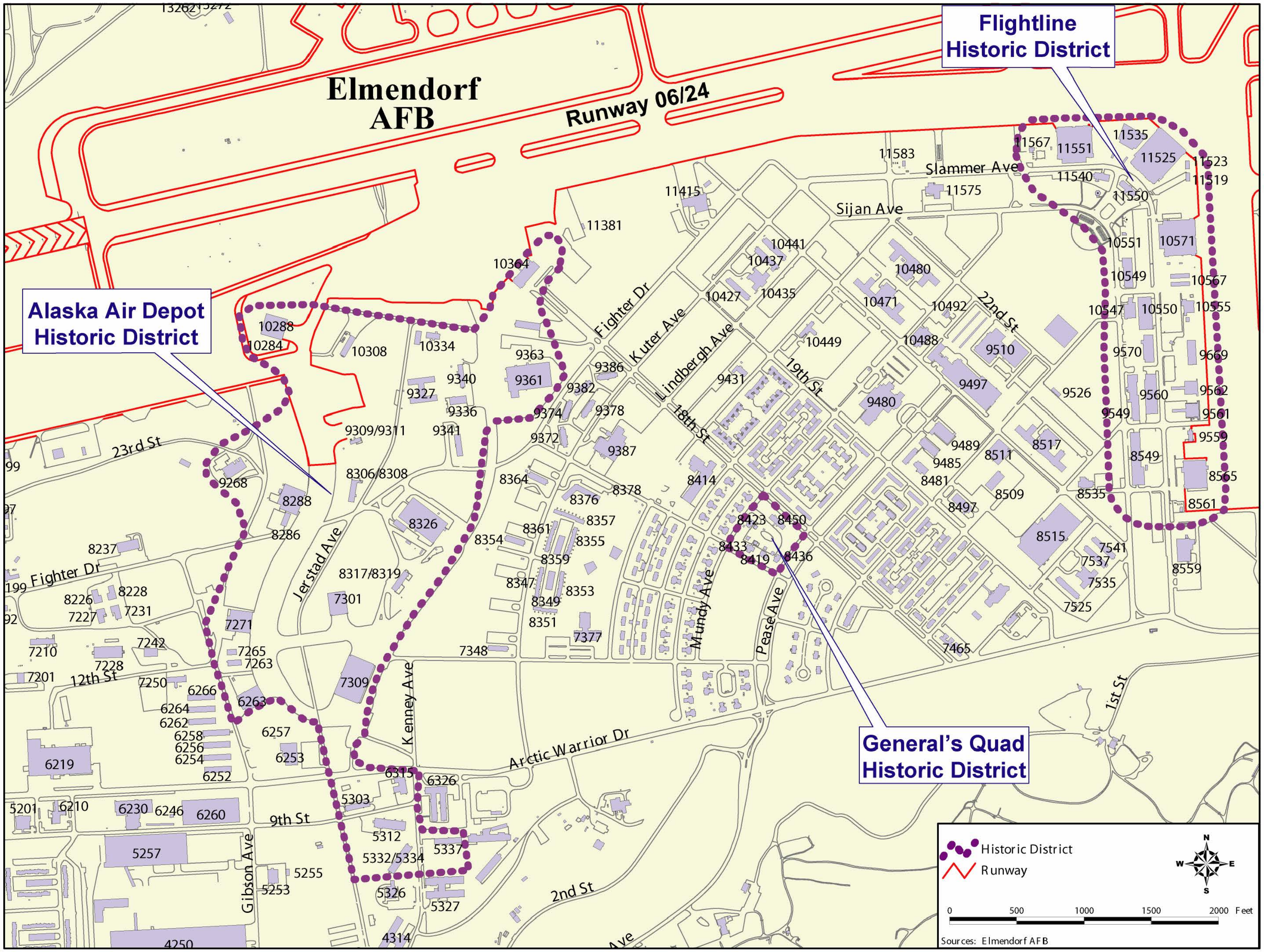


Figure 3.7-1. Elmendorf AFB Historic Districts

For all options, consultation with the Alaska SHPO regarding the potential effects to the viewshed of Hangar 16 (Building 15658) has occurred and the SHPO has concurred that there would be no adverse effect to the structure's setting under any of the options. However, compliance with Section 106 of the NHPA, including SHPO consultation regarding NRHP eligibility and potential effects to buildings that are eligible or that may be found to be eligible, would take place prior to demolition or renovation. All ground-disturbing activities have a possibility of encountering previously unrecorded and unknown archaeological resources. If suspected artifacts of any type (wood, stone, bone, metal, etc.) or other unidentifiable materials are inadvertently uncovered during ground disturbing activities, the soil disturbance activities in that area must cease until environmental staff can determine whether or not the materials warrant further actions under the Native American Graves Protection and Repatriation Act, Archeological Resources Protection Act, or the NHPA.

If bones are discovered in the course of excavation on the base, the work resulting in the discovery should stop, and the individual implementing the work (e.g., the non commissioned officer in charge or job foreman) will immediately notify the Cultural Resources Manager of the find. The Cultural Resources Manager will ensure that Integrated Cultural Resources Management Plan procedures are implemented (Air Force 2003b).

According to an agreement between Elmendorf AFB and the Alaska SHPO, only modifications to the exterior of an NRHP-listed or NRHP-eligible structure requires SHPO consultation. Modifications to the interior are not viewed as an impact to NRHP integrity, and do not necessitate SHPO consultation (personal communication, Lawton 2006).

3.7.3.1 Option A

Within the environs of Elmendorf AFB, Option A would develop new facilities to house the incoming F-22A squadrons in a development on the southeast portion of the base. The FTE development would cover approximately 50 acres in a single, consolidated location and include 19 construction, renovation, demolition, or infrastructure improvement projects to be implemented between 2006 and 2009. Option A also includes the construction of Flight Simulator and Field Training Detachment facilities away from FTE on the central portion of the base. This option would renovate two structures, Hangar 16 (Building 15658), built in 1954, and the Egress Shop (Building 10555), constructed in 1963. It would also demolish two existing structures constructed in 1963, the Sentry Gate House (Building 9637) and Ammunition Storage Igloo (Building 10641). Hangar 16 is eligible for the NRHP; the Egress Shop, the Sentry Gate House and the Ammunition Storage Igloo, although less than 50 years old, would need to be evaluated for possible inclusion on the NRHP on the merit of a Cold War era association, before demolition or exterior renovation. Option A has the potential to impact historic properties if consultation with the SHPO determines that exterior renovations to Hangar 16 will affect the eligibility of this NRHP-eligible structure, or if any of the other structures are eligible for the NRHP and exterior renovations would affect their NRHP eligibility. None of the structures that would be demolished or renovated under Option A is within any of the three historic districts found on base.

While there are no recorded archaeological resources in the areas of the proposed FTE development or Flight Simulator and Field Training Detachment facilities, and the areas have been previously disturbed during Elmendorf's history, the areas have not been surveyed for archaeological resources (Air Force 2003b). It is possible that ground disturbing activities could

encounter previously unknown and unevaluated cultural resources. If such resources were encountered, and if they were determined to be eligible for the NRHP, impacts to archaeological resources could occur under Option A.

3.7.3.2 Option B

For the Elmendorf AFB environ, Option B would develop new facilities to house the incoming F-22A squadrons on the southeast and east portions of the base. The FTE development would cover approximately 40 acres in two locations and include 17 construction, renovation, demolition, or infrastructure improvement projects to be implemented between 2006 and 2009. As with Option A, Option B includes the construction of Flight Simulator and Field Training Detachment facilities away from FTE on the central portion of the base. Six existing structures would be demolished or renovated. Hangars 15, 16, and 17 (Buildings 16716, 15658, and 16670) and the Egress Shop (Building 10555) would be renovated while the Ammunition Storage Igloo (Building 10641) and the Sentry Gate House (Building 9637) would be demolished. Building 16670 (Hangar 17) was constructed in 1995 and does not merit consideration for NRHP eligibility. Buildings 10641 and 9637 were constructed in 1962, Building 10555 in 1963, and Building 16716 in 1956. Building 15658 was constructed in 1954 and is considered eligible for the NRHP. All unevaluated structures proposed for demolition or exterior renovation and either older than 50 years or dating to the Cold War era would need to be evaluated for their NRHP eligibility prior to demolition or exterior renovation. Option B would have the potential to impact historic properties if consultation with the SHPO determines that exterior renovations to Hangar 16 will affect this NRHP-eligible structure, or if any of the other structures are eligible for the NRHP and exterior renovations would affect their eligibility. None of the structures that would be demolished or renovated under Option B is within any of the three historic districts found on base.

As with Option A, there are no recorded archaeological resources in the areas of the proposed FTE development or Flight Simulator and Field Training Detachment facilities. The areas have never been surveyed for archaeological resources (Air Force 2003b). It is possible that ground disturbing activities could encounter previously unknown and unevaluated cultural resources. If such resources were encountered, and if they were determined to be eligible for the NRHP, impacts to archaeological resources could occur under Option B.

3.7.3.3 Option C

Option C would develop new facilities to house the incoming F-22A squadrons on the southeast and east portions of the base where Option B construction would occur. In addition, Option C includes construction within the Flightline Historic District. Development would include 18 construction, renovation, demolition, or infrastructure improvement projects to be implemented between 2006 and 2009. Like Options A and B, Option C would also include the construction of Flight Simulator and Field Training Detachment facilities away from FTE on the central portion of the base. Like Option B, Option C would renovate Hangars 15, 16, and 17 (Buildings 16716, 15658, and 16670) and the Egress Shop (Building 10555) and would demolish the Ammunition Storage Igloo (Building 10641) and the Sentry Gate House (Building 9637). Under Option C, Hangars 2 and 3 (Buildings 11525 and 10571) would also be renovated. Constructed in 1995, Hangar 17 does not merit consideration for inclusion on the NRHP. Hangar 16, built in 1954, has been determined eligible for the NRHP. Hangars 2 and 3, constructed in 1945, are within the Flightline Historic District. Hangar 15 was constructed in 1956; the Ammunition Storage Igloo and the Sentry Gate House were both built in 1962; and the Egress Shop was built in 1963.

The NRHP eligibility of the six unevaluated structures would need to be determined prior to demolition or exterior renovation. Option C has the potential to impact historic properties if SHPO consultation determines that exterior renovations to Hangar 16 would affect this NRHP-eligible structure, or if any of the other structures are eligible for the NRHP and exterior renovations would affect their eligibility.

While there are no recorded archaeological resources in the areas of the proposed FTE development or Flight Simulator and Field Training Detachment facilities, the areas have never been surveyed for archaeological resources (Air Force 2003b). If ground disturbing activities encountered previously unknown and unevaluated cultural resources, and if they were determined to be eligible for the NRHP, then impacts to archaeological resources could occur under Option C.

3.7.3.4 No Action

Under the No Action Alternative, the F-22A would not be beddown at Elmendorf AFB. Construction associated with the beddown would not occur and impacts to cultural resources would not be expected under this alternative. In all cases, resources would continue to be managed in compliance with federal law and Air Force regulation.

3.8 Land Use and Transportation

3.8.1 Definition of Elmendorf AFB Land Use and Transportation

The attributes of Elmendorf AFB and nearby land use addressed in this analysis include general land use patterns, land ownership, land management plans, and applicable plans and ordinances. General land use patterns characterize the types of uses within a particular area including human land uses, such as agricultural, residential, commercial, industrial, institutional, and recreational, or natural land uses, such as forests, refuges, and other open spaces. Land ownership is a categorization of land according to type of owner; the major land ownership categories associated with Elmendorf AFB include federal and state with nearby private and Alaska Native properties. Land use plans and ordinances, policies, and guidelines establish appropriate goals for future use or regulate allowed uses.

Transportation resources include the infrastructure required for the movement of people, materials, and goods. For this analysis, transportation resources include roads and the railway.

3.8.2 Existing Conditions

Elmendorf AFB is located at the head of Cook Inlet within the municipality of Anchorage. The installation comprises 13,455 acres of federal land directly north of the municipality of Anchorage in the southcentral portion of the state of Alaska.

Elmendorf AFB Land Use. Figure 3.8-1 depicts existing land uses for Elmendorf AFB. The airfield and related operation function are located in the center and southern part of the base. A variety of other land uses may be found along the southern portion of the base. A large industrial area forms a boundary between the central mixed-use core of the base and the housing and services area in the base's southwest corner. Medical facilities are located in the southeast corner, along with some housing and recreational areas. Large recreational and open space areas are also located north of the airfield (Air Force 2005d). Restricted Use Areas have been designated to prohibit construction of manned facilities in areas that were previously contaminated.

THE SOUTHWEST CORNER OF THE BASE HAS HOUSING DEVELOPMENTS, COMMUNITY SERVICES, AND OFFICES.

The base is bordered by U.S. Army Fort Richardson to the east. There are various training ranges within the military installations, including maneuver areas, impact areas, and training areas. To the west of Elmendorf AFB are the Port of Anchorage and Cook Inlet/Knik Arm. The city of Anchorage borders the base to the south. Privately held lands in the vicinity of the base are located primarily south and southeast of the base (Air Force 2001a). This includes a residential neighborhood known as Mountain View. Mountain View Elementary School is located on the north side of McPhee Avenue that runs along the southern boundary of Elmendorf AFB.

The base adopted a General Plan in April 2005 that presents a comprehensive planning strategy to support military missions assigned to the installation and guide future installation development decisions. With a 50 year horizon, the plan presents a summary of existing conditions and provides a framework for programming, design and construction, as well as resource management. The future land use plan depicts opportunities for a more functional grouping of land use types through the use of focus areas. Specifically, the plan recommends a FTE Focus Area on the east side of the north-south runway. This area would enable development of all the necessary facilities and infrastructure associated with the beddown of fighter aircraft (Air Force 2005d).

Base plans and studies present factors affecting both on- and off base land use and include recommendations to assist on-base officials and local community leaders in ensuring compatible development in the vicinity of the base. In general, land use recommendations are made for areas affected by both the potential for aircraft accidents (refer to Section 3.3, Safety) and aircraft noise (refer to Section 3.2, Noise). There are safety zones defined for each end of the runway based on the analysis of historic mishap data that defines where most aircraft accidents occur. Incompatible residential uses in the community of Mountain View exist within the safety zones at the end of Runway 16/34 (Air Force 2000b).

Noise contours in these plans are generated by the modeling program NOISEMAP. These noise contours are used to describe noise exposure around the base and support compatible land use recommendations. Noise is one of the major factors used in determining appropriate land uses since elevated sound levels are incompatible with certain land uses. When noise levels exceed an L_{dn} of 65 dB, residential land uses are normally considered incompatible. Noise exposure (depicted with contours) from operations occurring today at Elmendorf AFB are shown in Figure 3.2-1. These contours provide the baseline against which to measure the projected change should the F-22A be based at Elmendorf AFB.

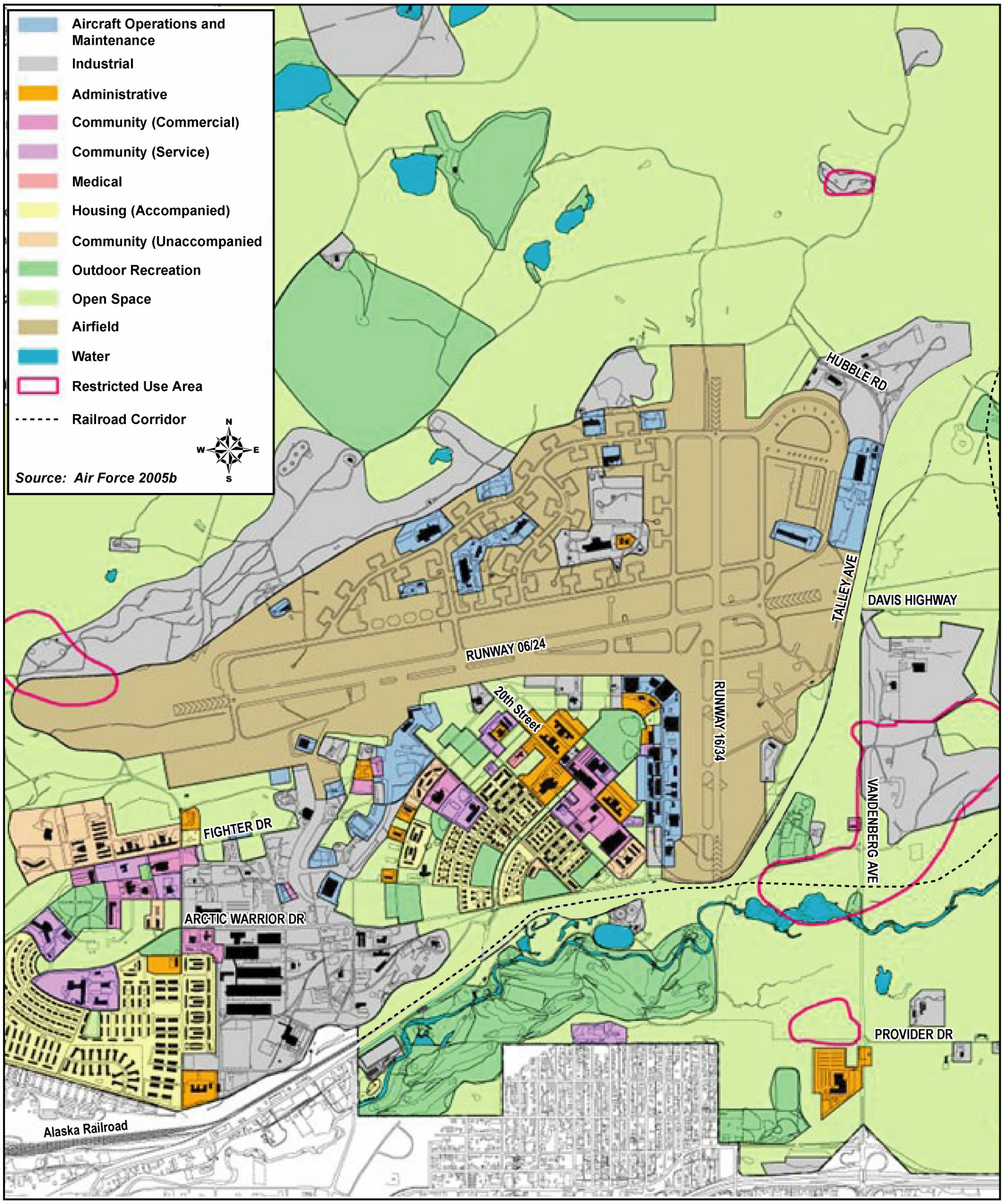


Figure 3.8-1. Elmendorf AFB Existing Land Use

Transportation. Elmendorf AFB is accessed by Davis Highway from Fort Richardson and Glenn Highway from the south. Vandenburg Avenue extends northward from the main gate (Boniface Gate) about 1.5 miles before intersecting Davis Highway which extends eastward to Fort Richardson.

Roads on Elmendorf AFB form a network independent from vicinity roads (refer to Figure 3.8-2). Access on and off the base occur through four gates on the south side (Boniface, Muldoon, Post Road, and Government Hill), and one access from Fort Richardson. Vehicular traffic is permitted on most base streets; restricted access may occur for operational or security reasons.

Primary roadways on Elmendorf include Davis Highway and Post Road. The former serves the eastern portion of the base and provides primary access to Fort Richardson. Provider Drive, which connects to the Glenn Highway, also provides important access to the southeast corner of the base including the hospital. Secondary roadways include Airlifter Drive, Fighter Drive, and Arctic Warrior Drive. The latter provides access from the west side of the base to the FTE area. The FTE area is also accessed by Vandenberg Avenue and the Davis Highway.

The rail line is located in the south and east portions of Elmendorf AFB (refer to Figure 3.8-2). The tracks have been relocated to the east to avoid security and safety hazards. The tracks are within the right of way and belong to the Alaska Railroad Company. All other tracks on the base are owned by the Air Force (Air Force 2004a).


THE RAIL LINE HAS BEEN RELOCATED TO THE EAST FROM THIS PHOTOGRAPHED LOCATION FOR SAFETY AND SECURITY REASONS.

3.8.3 ENVIRONMENTAL CONSEQUENCES

As described in Chapter 2.0, the key elements of the proposal are flight activities, facility construction, and personnel changes. Established and recognized noise models have been applied to estimate the off base and on base noise conditions. These models are described in Appendix D. For the land use and transportation resources, consequences are associated with increases in noise due to an increase in sorties or change in aircraft capability. Potential effects to land use plans, land use patterns and circulation due to construction or personnel increases are considered.

3.8.3.1 OPTION A

Under Option A, the total geographic area exposed to Ldn 65 or more would be approximately 9.5 percent less than under current conditions. The area affected by noise anticipated under this option is presented on Figure 3.2-1. This area includes a portion of the Knik Arm, a portion of the Port of Anchorage, and a portion of the Port MacKenzie area across the Knik Arm. Some areas on base would experience higher noise levels. These changes in the noise environment should not result in changes to land management, land use, or land ownership.

The DoD and FAA adopted the concept of land use compatibility as an accepted measure of aircraft noise effect. USEPA has reaffirmed these concepts (see Section 3.2.3). The FAA has guidelines that establish the best means for determining noise impact in airport communities. Industrial land uses, such as ports, are compatible within the 65 dB noise contours.

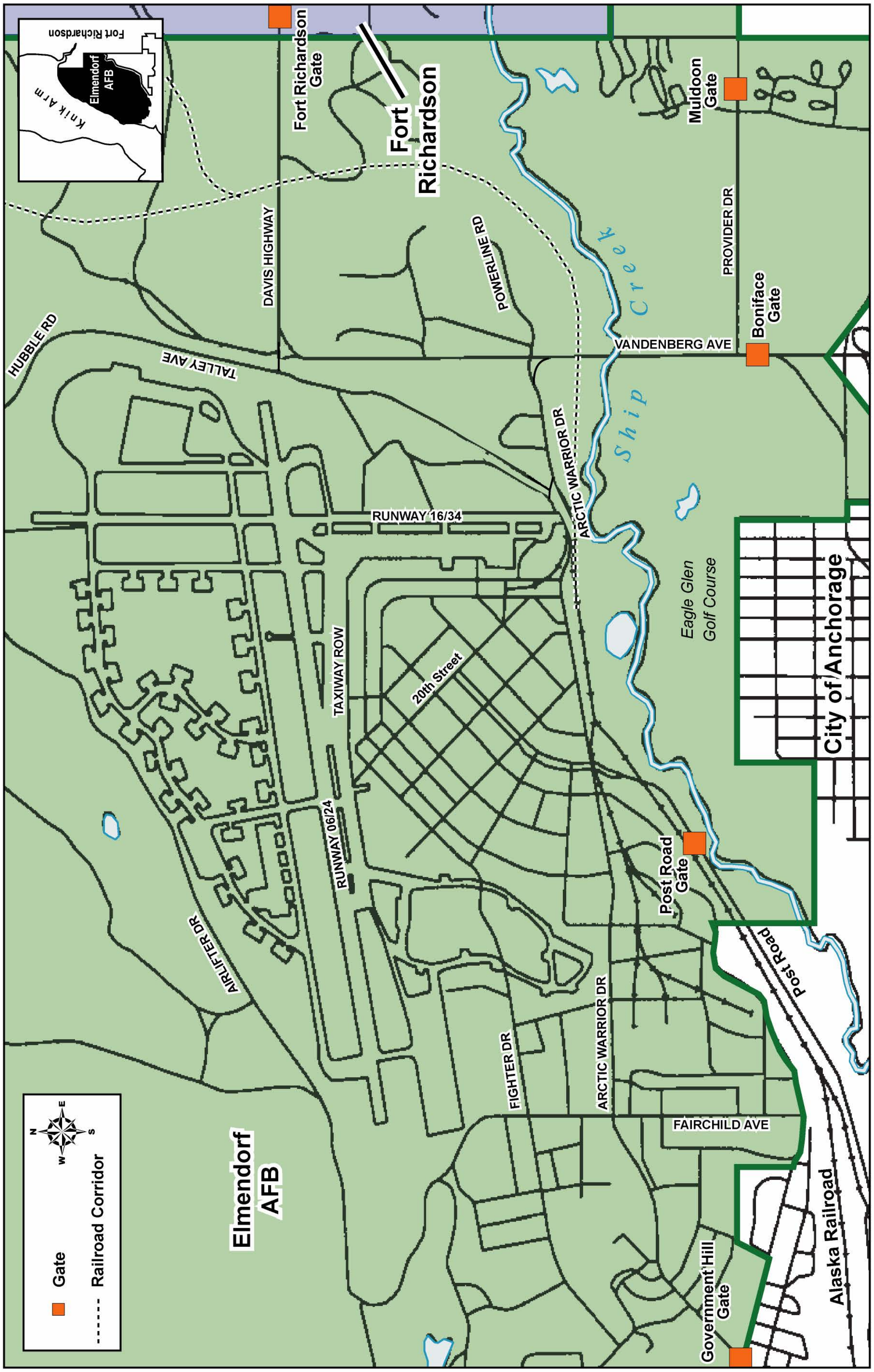


Figure 3.8-2. Elmendorf AFB Roads

The Elmendorf AFB noise abatement program precludes flight operations between 10 p.m. and 7 a.m. except for national emergency or infrequent large scale exercises. This program reduces the potential for noise impacts upon land uses and helps define the 65 dB contours. Although the F-22A operations will produce some increase in noise exposure within the base boundaries and over compatible land uses, that increase should not result in changes to land use or land ownership.

Proposed facility and infrastructure construction is consistent with the current Base General Plan, as it is proposed for the FTE Focus Area. No changes to the safety zones are anticipated under the Proposed Action. The incompatible land use in Mountain View would continue.

A comparison of Figure 3.8-1 and the potential development areas in Figure 1.1-1 demonstrates that FTE is adjacent to and outside of the restricted use area identified in Figure 3.8-1.

A 7.9 percent decrease in on-base employment is likely to reduce vehicle trips in the long term. Increased traffic during construction would contribute to increased congestion at gates and in the processing of access passes. Commuters to and from the installation during the morning and evening peak travel periods would be expected to face increased traffic during the 2007-2010 period. The short-term increase and long-term reduction in traffic are not likely to substantially affect commute times; however, adjacent intersections and access gates may experience increased congestion during construction.

3.8.3.2 Option B

Under Option B, the number of annual sorties would be the same as those described in Option A; thus, the noise effects are identical. Land use consequences are the same as those described for Option A.

Option B includes a variation on the construction, renovation, and infrastructure improvement projects. There could be minor changes in construction traffic, but the traffic consequences would be basically as described for Option A. Option B is consistent with the General Plan. Personnel changes are identical to those described in Option A.

3.8.3.3 Option C

Option C is identical to Option A for flight activities and personnel changes. However, Option C presents a variation on facility construction that uses and/or modifies facilities vacated by the BRAC relocation of F-15C and F-15E aircraft. New F-22A facilities would be constructed in the FTE area, but aircraft beddown locations would be spilt into three areas and away from existing maintenance facilities. Traffic patterns would not be expected to be substantially different from the discussion under Option A, although the three locations would distribute construction traffic more under Option C than under the other options. Option C varies from the Base General Plan's Focus Area concept, but is consistent with the functional grouping of land uses.

3.8.3.4 No Action

Under the No Action Alternative, F-22A aircraft would not be assigned to Elmendorf AFB at this time. F-15C and F-15E aircraft would continue to operate until BRAC schedules were resolved. Consequently, there would be no change to the noise environment and no F-22A related facility construction or personnel changes would occur.

3.9 Socioeconomics

Socioeconomic factors are defined as the basic attributes and resources associated with the human environment. The relevant factors related to the proposed F-22A beddown at Elmendorf AFB include:

- Population and housing
- Economic activity
- Public services

Data for the socioeconomic analysis in this EA were obtained from a variety of sources, including the Air Force, the U.S. Bureau of the Census, the U.S. Bureau of Economic Analysis, the Alaska Departments of Commerce and Labor, and the Municipality of Anchorage.

3.9.1 Definition of Elmendorf AFB Socioeconomics

Elmendorf AFB is situated in south-central Alaska, just north of Anchorage. Socioeconomic activities associated with the base are concentrated in the Municipality of Anchorage, which comprises the ROI for this analysis. Available socioeconomic characteristics are addressed for the base population and for the Municipality of Anchorage.

3.9.2 Existing Conditions

3.9.2.1 Population and Housing

The population of 18,000 individuals associated with Elmendorf AFB is comprised of 6,500 military personnel, 9,600 military family members, and 1,900 civilian employees (Air Force 2005e). Approximately 7,000 military personnel and their family members reside in on-base housing, including personnel living in privatized housing. Recent private sector on-base housing initiatives have improved housing for Elmendorf and Fort Richardson personnel. The remaining base employees and their families primarily reside within the Municipality of Anchorage, including the communities of Chugiak and Eagle River.

The 2003 population of the Municipality of Anchorage was 270,951 persons. This is an increase between 1990 and 2000 of an average annual rate of 1.4 percent. Population in the municipality is projected to increase at an average annual rate of 0.9 percent to 308,144 persons by the year 2018 (Alaska Department of Labor 1998). Anchorage is the largest city in Alaska, accounting for over 40 percent of the state population. The average household size in the municipality is 2.67 persons. Almost 95 percent of the 100,000 housing units are occupied, yielding a relatively low vacancy rate of 5.5 percent. By comparison, the vacancy rate statewide is 15.1 percent, primarily due to seasonal occupancy.

3.9.2.2 Economic Activity

Elmendorf AFB makes an important contribution to the Anchorage economy through employment of military and civilian personnel and expenditures for goods and services from local businesses. Elmendorf AFB's annual payroll obligates $481 million to its military and civilian employees. In FY 2005, the Air Force contributed an estimated $272 million in construction and service contracts and other purchases from local businesses. Elmendorf AFB has a total annual economic impact on the regional economy of over $880 million, supporting 3,060 secondary jobs and generating $128 million in annual secondary income (Air Force 2005e).

Anchorage is the center of commerce for the state of Alaska, an economy driven by four major sectors: oil/gas, military, transportation, and tourism. These sectors have provided a level of stability to the region and contributed to 15 consecutive years of economic growth. A number of industries are headquartered in Anchorage, including oil and gas enterprises, finance and real estate, transportation, communications, and government agencies.

While the unemployment rate is generally low, there are seasonal fluctuations related to resource usage, including commercial fishing and processing activities. Average unemployment in Anchorage was 5.7 percent in 2003, fluctuating between 4.1 percent and 7.4 percent during the period from 1990-2000. In the Anchorage region, total full- and part-time employment increased from 157,120 jobs in 1990 to 188,885 jobs in 2003, at an average annual rate of 1.4 percent (U.S. Bureau of Economic Analysis 2005). The largest employment sectors are government (21.6 percent), retail trade (11.3 percent), and health care and social services (10.6 percent). The military accounts for 11,527 jobs in Anchorage, representing 28.3 percent of government employment and 6.1 percent of total employment. Military employment has steadily declined as a percentage of the region from 11.0 percent of total employment in 1980, to 8.5 percent in 1990, to the current 6.1 percent.

3.9.2.3 Public Services

Daily operation of Elmendorf AFB, and furnishing of services and support to base personnel and family members, is the responsibility of the 3 WG, the base host unit. Off base public services are provided by a number of public and private entities. Police and fire protection services are provided by the Anchorage Police and Fire Departments, respectively. Anchorage Regional Hospital and various medical care providers offer health services in the area. The 3rd Medical Group in collaboration with the Veterans Administration provides hospital and medical care on Elmendorf AFB.

The Anchorage school district serves the Elmendorf AFB population, including three elementary schools, one middle school, and one high school. Elmendorf AFB provides youth programs, teen centers, and childcare services for military families residing and working on base.

3.9.3 Environmental Consequences

Existing population and employment characteristics in Anchorage were analyzed to assess the potential socioeconomic impacts of the proposed beddown, as presented in Section 3.9.2. The Proposed Action, described in detail in Chapter 2.0, involves two factors that may affect socioeconomic resources: personnel changes and facility modification. The anticipated net change in base employment amounts to a decline of 669 personnel under any option. Facility modifications associated with the F-22A beddown consist of a series of construction, renovation, and infrastructure improvement projects of approximately five years.

Socioeconomic impacts would occur if changes associated with the options substantially affected demand for housing or community services, such as schools, or substantially affected economic stability in the region. For each option described below, the potential population, employment, income, and output impacts are estimated and quantified to determine their potential effect on the region.

3.9.3.1 Option A

Construction Impacts

Under Option A, a total of 19 construction, renovation, or infrastructure improvement projects would be implemented over the period from 2006 to 2009. Total estimated cost of facility requirements under this option is $402 million (see Table 3.9-1). Potential direct impacts are estimated to include 1,904 construction jobs over the entire construction period and $102 million in direct earnings. The total socioeconomic impact of the proposed construction projects amount to an estimated $497 million in total economic activity, generating 4,030 total jobs and total earnings of $156 million. It is estimated that 10 percent of the needed workforce may temporarily relocate and take up residency in the region. Population impacts associated with construction may yield as many as 100 in-migrating residents each year of the construction period, a population increase of less than 0.1 percent. These potential impacts would be temporary, however, only occurring for the duration of the construction period. No permanent or long-lasting socioeconomic impacts are associated with construction under Option A.

Table 3.9-1. Construction-Related Economic Impacts

		Direct Impacts		Total Impacts		
	Estimated Cost	*Jobs*	*Income*	*Jobs*	*Income*	*Output*
Option A	$402,000,000	1,904	$102,400,000	4,030	$156,200,000	$497,300,000
Option B	$323,000,000	1,526	$82,100,000	3,230	$125,100,000	$472,800,000
Option C	$325,000,000	1,536	$82,600,000	3,250	$125,900,000	$475,800,000

Operational Impacts

Beddown of the F-22A Operational Wing would require personnel to operate and maintain the aircraft and provide necessary support services. Because the F-22A incorporates advanced computer checks and different maintenance, fewer personnel would be needed for the F-22A squadron than for the equivalent F-15C and F-15E squadrons. Total personnel under Option A would be reduced by a net of 669 positions. This is comprised of a reduction of 36 officers and 759 enlisted personnel partially offset by a gain of 126 civilian positions. This reduction would represent approximately 7.9 percent of the base employment. On average, this would reflect a payroll reduction of $40.4 million. The reduction in base employment would have a secondary effect of reducing 223 off base positions currently supported by this portion of associated base payroll.

It is estimated that 70 percent of departing military personnel would have family members, while the remaining 30 percent are unaccompanied. Based on the average family size of active duty personnel at Elmendorf AFB, an estimated 697 family members would depart, for a total anticipated population decline of 1,366 persons. A decrease of this size represents 7.4 percent of the Elmendorf AFB base-related population and 0.5 percent of the Anchorage population. Elmendorf AFB is a dynamic installation with regular changes in missions and personnel. The proposed change in base employment is not expected to be noticed in the overall base dynamics.

The Air Force makes on-base housing vacated by departing personnel available for military personnel residing off base. If 70 percent of the departing military personnel have a housing unit and the remainder share a unit with another military person, an estimated 570 off base

units would be vacated by this reduction in personnel. This would represent approximately 0.5 percent of housing in the Municipality of Anchorage. Since this personnel reduction would occur over several years in a dynamic large community, this change is not likely to be noticed.

3.9.3.2 Option B

Construction Impacts

Under Option B, a total of 17 construction, renovation, or infrastructure improvement projects would be implemented over the period from 2006 to 2009. Total estimated cost of facility requirements under this option is $323 million (see Table 3.9-1). Potential direct impacts are estimated to include 1,526 construction jobs over the entire construction period and $82 million in direct earnings. The total socioeconomic impact of the proposed construction projects amount to an estimated $473 million in total economic activity, generating 3,230 total jobs and total earnings of $125 million. It is estimated that 10 percent of the needed workforce may temporarily relocate and take up residency in the region. Population impacts associated with construction may yield as many as 100 in-migrating residents each year of the construction period, a population increase of less than 0.1 percent. These potential impacts would be temporary, however, only occurring for the duration of the construction period. No permanent or long-lasting socioeconomic impacts are associated with construction under Option B.

Operational Impacts

Operational impacts under Option B would be the same as under Option A. Beddown of the F-22A Operational Wing would require personnel to operate and maintain the aircraft and provide necessary support services. Population, payroll, and housing consequences would be as described for Option A. A decrease over several years of 7.4 percent of the Elmendorf AFB base-related population and 0.5 percent of the Anchorage population would not be expected to be noticed in the Municipality of Anchorage.

3.9.3.3 Option C

Construction Impacts

Under Option C, a total of 18 construction, renovation, or infrastructure improvement projects would be implemented over the period from 2006 to 2009. Total estimated cost of facility requirements under this option is $325 million (see Table 3.9-1). Potential direct impacts are estimated to include 1,536 construction jobs over the entire construction period and $83 million in direct earnings. The total socioeconomic impact of the proposed construction projects amount to an estimated $476 million in total economic activity, generating 3,250 total jobs and total earnings of $126 million. It is estimated that 10 percent of the needed workforce may temporarily relocate and take up residency in the region. Population impacts associated with construction may yield as many as 100 in-migrating residents each year of the construction period, a population increase of less than 0.1 percent. These potential impacts would be temporary, however, only occurring for the duration of the construction period. No permanent or long-lasting socioeconomic impacts are associated with construction under Option C.

Operational Impacts

Operational impacts under Option C would be the same as described for Option A for population, payroll, and housing. Total personnel under Option C would be reduced by 669 positions and an estimated 697 family members would also depart. A decrease of 7.4 percent of

the Elmendorf AFB base-related population would be approximately 0.5 percent of the Anchorage population.

3.9.3.4 No Action

Under the No Action Alternative, no beddown of the Second F-22A Operational Wing would occur at Elmendorf AFB at this time. The proposed facility modifications and personnel changes would not take place; therefore no socioeconomic effects associated with the F-22A would be anticipated.

3.10 Environmental Justice

EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, directs federal agencies to address environmental and human health conditions in minority and low-income communities. In addition to environmental justice issues are concerns pursuant to EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, which directs federal agencies to identify and assess environmental health and safety risks that may disproportionately affect children.

For purposes of this analysis, minority, low-income and youth populations are defined as follows:

- *Minority Population*: Alaska Natives, persons of Hispanic origin of any race, Blacks, American Indians, Asians, or Pacific Islanders.
- *Low-Income Population*: Persons living below the poverty level.
- *Youth Population*: Children under the age of 18 years.

Estimates of these three population categories were developed based on data from the U.S. Bureau of the Census. The census does not report minority population, per se, but reports population by race and by ethnic origin. These data were used to estimate minority populations potentially affected by implementation of the Proposed Action. Low-income and youth population figures also were drawn from the Census 2000 Profile of General Demographic Characteristics.

3.10.1 Definition of Elmendorf AFB Environmental Justice

Elmendorf AFB is situated in south-central Alaska, just north of Anchorage. Socioeconomic activities associated with the base are concentrated in the Municipality of Anchorage, which comprises the ROI for this analysis. Environmental Justice characteristics are addressed for the base population, when available, and for the Municipality of Anchorage. In addition, the area of land situated outside the Elmendorf AFB boundaries but within the new 65 L_{dn} noise contour is addressed. The two affected geographic areas comprise a total 31.3 acres and, due to their industrial and rural nature, do not have permanent residents within the 65 dB contours.

3.10.2 Existing Conditions

To comply with EO 12898, ethnicity and poverty status in the vicinity of Elmendorf AFB were examined and compared to state and national data. Minority persons represent 30.1 percent of the Municipality of Anchorage population (U.S. Bureau of the Census 2000a). Alaska Natives account for most of the minority population in Anchorage, representing 7.0 percent of the total population and 23.4 percent of the minority population. By comparison, minority persons

represent 32.4 percent of the state population, with Alaska Native accounting for 47.5 percent of the state minority population.

The incidence of persons and families in the Municipality of Anchorage with incomes below the poverty level was comparable to state levels. In Anchorage during 2000, 7.3 percent of persons were living below the poverty level, compared to 9.4 percent of persons in the state and 12.4 percent of persons in the nation (U.S. Census 2005).

To comply with EO 13045, the number of children under age 18 was determined for the vicinity of Elmendorf AFB and compared to state and national levels. In 2000, there were 75,742 children age 17 and under residing in Anchorage, comprising 29.1 percent of the population. This compares to 30.4 percent for the State of Alaska and 25.7 percent for the nation.

3.10.3 Environmental Consequences

Disadvantaged groups within the general vicinity of Elmendorf AFB, including minority, low-income and youth populations, do not represent a disproportionate segment of the population. The flight activity, facility modifications and personnel changes associated with the Proposed Action options are not expected to create significantly adverse environmental or health effects.

3.10.3.1 Option A

No residential land or minority or disadvantaged populations would be under the projected 65 dB noise contour. The reduction in long-term employment and the short-term increase in construction employment are not expected to disproportionately affect disadvantaged populations. There would be no disproportionate impact upon children. No adverse health or safety risks to children are anticipated as a result of implementation of Option A.

3.10.3.2 Option B

Potential effects to minority, low-income populations, or youth would be the same as those described under Option A.

3.10.3.3 Option C

Potential effects to minority, low-income populations, or youth would be the same as those described under Option A.

3.10.3.4 No Action

Under the No Action alternative, no changes in flight activity, noise contours, facilities, or personnel are anticipated. No impacts to disadvantaged or youth populations would occur.

4.0 TRAINING SPECIAL USE AIRSPACE AFFECTED ENVIRONMENT AND CONSEQUENCES

This chapter contains both the affected environment and environmental consequences analysis for the Proposed Action and No Action Alternative within the training special use airspace associated with Elmendorf Air Force Base (AFB). The National Environmental Policy Act (NEPA) requires that the analysis address those areas and the components of the environment with the potential to be affected; locations and resources with no potential to be affected need not be analyzed.

Each resource discussion begins with a *definition* including resource attributes and any applicable regulations. The expected geographic scope of potential impacts is also identified as the Region of Influence (ROI). The ROI is defined as the outermost boundary of potential environmental consequences. For most resources in this chapter, the ROI is defined as the lands underlying the Military Operations Areas (MOAs) and Restricted Areas. However, for some resources (such as Air Quality and Socioeconomics), the ROI extends over a larger jurisdiction unique to the resource.

The *Existing Condition* of each relevant environmental resource is described to give the public and agency decision-makers a meaningful point from which they can compare potential future environmental, social, and economic effects. The *Environmental Consequences* section for each resource considers the direct and indirect effects of the Proposed Action and No Action Alternative described in Chapter 2.0 of this Environmental Assessment (EA). Cumulative effects are discussed in Chapter 5.0.

4.1 Airspace Management

4.1.1 Definition

As explained under Section 3.1.1., navigable airspace is a national resource administered by the Federal Aviation Administration (FAA). FAA has charted and published Special Use Airspace (SUA) for military and other governmental activities. Management of SUA considers how airspace is designated, used, and administered to best accommodate the individual and common needs of military, commercial, and general aviation. The FAA considers multiple and sometimes competing demands for aviation airspace in relation to airport operations, Federal Airways, Jet Routes, military flight training activities, and other special needs to determine how the National Airspace System can best be structured to address all user requirements.

The FAA has designated four types of airspace within the United States (U.S.): Controlled, Special Use, Other, and Uncontrolled airspace. Controlled airspace is airspace of defined dimensions within which air traffic control service is provided to Instrument Flight Rule (IFR) flights and to Visual Flight Rule (VFR) flights in accordance with the airspace classification (Pilot/Controller Glossary [P/CG] 2004). Controlled airspace is categorized into five separate classes: Classes A through E. These classes identify airspace that is controlled, airspace supporting airport operations, and designated airways affording en route transit from place-to-place. The classes also dictate pilot qualification requirements, rules of flight that must be followed, and the type of equipment necessary to operate within that airspace. Elmendorf aircrews fly under FAA rules when not training in SUA.

SUA is designated airspace within which flight activities are conducted that require confinement of participating aircraft, or place operating limitations on non-participating aircraft. Restricted Areas and MOAs are examples of SUA.

Other airspace consists of advisory areas, areas that have specific flight limitations or designated prohibitions, areas designated for parachute jump operations, Military Training Routes (MTRs), and Aerial Refueling Tracks (ARs). This category also includes Air Traffic Control Assigned Airspace (ATCAAs). When not required for other needs, ATCAA is airspace authorized for military use by the managing Air Route Traffic Control Center (ARTCC), usually to extend the vertical boundary of SUA.

Uncontrolled airspace is designated Class G airspace and has no specific prohibitions associated with its use.

Military training airspace currently used by aircrews at Elmendorf AFB includes MOAs, ATCAAs, MTRs, and Restricted Areas. Use of these airspace units is normally scheduled by the owning/using agency, and is managed by the military or the applicable ARTCC.

4.1.2 Existing Conditions

This section discusses the existing SUA that supports F-15C and F-15E training activity from Elmendorf AFB. Refer to Figure 2.2-1 for a depiction of airspace types. Alaskan SUA is managed by the 11th Air Force Commander.

4.1.2.1 Military Operations Areas

A MOA is airspace of defined vertical and lateral limits to separate and segregate certain non-hazardous military activities from IFR traffic and to identify for VFR traffic where these activities are conducted (P/CG 2004). A MOA is outside Class A airspace. Class A airspace covers the continental U.S. and limited parts of Alaska, including the airspace overlying the water within 12 nautical miles (NM) of the U.S. coast. Class A airspace extends from 18,000 feet above mean sea level (MSL) up to and including 60,000 feet MSL (P/CG 2004).

MOAs are considered "joint use" airspace. Non-participating aircraft operating under VFR are permitted to enter a MOA, even when the MOA is active for military use. Aircraft operating under IFR must remain clear of an active MOA unless approved by the responsible ARTCC. Flight by both participating and VFR non-participating aircraft is conducted under the "see-and-avoid" concept, which stipulates that "when weather conditions permit, pilots operating IFR or VFR are required to observe and maneuver to avoid other aircraft. Right-of-way rules are contained in Code of Federal Regulations (CFR) Part 91" (P/CG 2004). The responsible ARTCC provides separation service for aircraft operating under IFR and MOA participants. The "see-and-avoid" procedures mean that if a MOA were active during inclement weather, the general aviation pilot could not safely access the MOA airspace.

Table 4.1-1 describes the MOAs used by Elmendorf AFB and other Alaskan military users for flight training.

Table 4.1-1. Description of MOAs

MOA	Altitudes		Hours of Use [1]		Controlling ARTCC
	Minimum	*Maximum*[2]	*From*	*To*	
Galena	1,000 AGL	FL 180[3]	8:00 a.m.	6:00 p.m.	Anchorage
Naknek 1	3,000 AGL	FL 180	10:00 a.m.	3:00 p.m.	Anchorage
Naknek 2	3,000 AGL	FL 180	10:00 a.m.	3:00 p.m.	Anchorage
Stony A	100 AGL	FL 180	8:00 a.m.	6:00 p.m.	Anchorage
Stony B	2,000 AGL	FL 180	8:00 a.m.	6:00 p.m.	Anchorage
Susitna	10,000 MSL or 5,000 AGL (whichever is higher)	FL 180	8:00 a.m.	6:00 p.m.	Anchorage
Birch	500 AGL	Up to and including 5,000 MSL	8:00 a.m.	6:00 p.m.	Anchorage
Buffalo	300 AGL	7,000 MSL	8:00 a.m.	6:00 p.m.	Anchorage
Eielson	100 AGL	FL 180	8:00 a.m.	6:00 p.m.	Anchorage
Fox 1	5,000 AGL	FL 180	8:00 a.m.	6:00 p.m.	Anchorage
Fox 2	7,000 MSL	FL 180	8:00 a.m.	6:00 p.m.	Anchorage
Fox 3	5,000 AGL	FL 180	8:00 a.m.	6:00 p.m.	Anchorage
Yukon 1	100 AGL	FL 180	8:00 a.m.	6:00 p.m.	Anchorage
Yukon 2	100 AGL	FL 180	8:00 a.m.	6:00 p.m.	Anchorage
Yukon 3 High	10,000 MSL	FL 180	10:00 a.m.	3:00 p.m.	Anchorage
Yukon 3A Low	100 AGL	10,000 MSL	10:00 a.m. 1:30 p.m.	11:30 a.m. 3:00 p.m.	Anchorage
Yukon 3B	2,000 AGL	FL 180	Only During Major Flying Exercise		Anchorage
Yukon 4	100 AGL	FL 180	10:00 a.m.	3:00 p.m.	Anchorage
Yukon 5	5,000 AGL	FL 180	Only During Major Flying Exercise		Anchorage
Viper[4]	500 AGL	FL 180	7:00 a.m.	10:00 p.m.	Anchorage

Notes:
1. Days of use are Monday through Friday. All times are local times as normally scheduled.
2. Maximum is up to, but not including unless otherwise noted.
3. Described in terms of hundreds of feet MSL using a standard altimeter setting. Thus, FL180 is approximately 18,000 feet MSL.
4. Viper A/B are divided at 10,000 feet MSL.

FL = Flight Level; AGL = above ground level; MSL = mean sea level

Source: FAA 2000

4.1.2.2 Air Traffic Control Assigned Airspace

An ATCAA is airspace of defined vertical and lateral limits, assigned by Air Traffic Control (ATC), for the purpose of providing air traffic segregation between the specified activities being conducted within the assigned airspace and other IFR air traffic (P/CG 2004). This airspace, if not required for other purposes, may be made available for military use. ATCAAs are normally structured and used to extend the horizontal and/or vertical boundaries of SUA such as MOAs and Restricted Areas.

With the exception of the Buffalo MOA and the Birch MOA, all of the MOAs currently used by Elmendorf AFB aircrews have associated ATCAAs. Through letters of agreement with the FAA, ATCAAs may extend up to and above 60,000 feet MSL. Several of the airspace units used by Elmendorf AFB aircrews are "capped" at lower altitudes by the managing ARTCC to allow unimpeded transit by civil and commercial aircraft traffic.

4.1.2.3 Military Training Routes

MTRs are flight corridors developed and used by the Department of Defense (DoD) to practice high-speed, low-altitude flight, generally below 10,000 feet MSL. Specifically, MTRs are airspace of defined vertical and lateral dimensions established for the conduct of military flight training at airspeeds in excess of 250 knots indicated airspeed (KIAS) (P/CG 2004). MTRs are developed in accordance with criteria specified in FAA Order 7610.4 (DoD 2004). They are described by a centerline, with defined horizontal limits on either side of the centerline, and vertical limits expressed as minimum and maximum altitudes along the flight track. MTRs are identified as Visual Routes (VRs) or Instrument Routes (IRs). No changes to MTRs are proposed as part of the F-22A beddown.

VRs are used by DoD and associated Reserve and Air Guard units for the purpose of conducting low-altitude navigation and tactical training under VFR below 10,000 feet MSL at airspeeds in excess of 250 KIAS. IRs are used by DoD, including associated Reserve and Air Guard units, for the purpose of conducting low-altitude navigation and tactical training in both IFR and VFR weather conditions at airspeeds in excess of 250 KIAS.

MTRs supporting Elmendorf operations are described in Table 4.1-2. These MTRs are grouped in packages of four routes. Two of the routes are VRs and two are IRs. All four routes cover the same ground track under different conditions. One MTR over the ground track will be for one direction, VFR training, another for the opposite direction VFR training, and the remaining two for IR training in each direction. Thus, if a pilot is assigned a specific numbered route, the pilot knows no one else is using a different number that occupies the same airspace.

4.1.2.4 Restricted Areas

A Restricted Area is designated airspace that supports ground or flight activities that could be hazardous to non-participating aircraft. A Restricted Area is designated under 14 CFR Part 73, within which the flight of non-participating aircraft, while not wholly prohibited, is subject to restriction. Most restricted areas are designated "joint-use" and IFR/VFR operations in the area may be authorized by the controlling ATC facility when it is not being utilized by the using agency. The restricted airspaces, R-2202, R-2203, and R-2205, are Army ranges used by the Air Force for training. R-2206 is not a flying range. R-2211 is Air Force-owned and managed airspace to support training activities. According to FAA Order 7400.8M, R-2202C is between 10,000 and 29,000 feet MSL and R-2202D is 31,000 feet MSL to unlimited. Specific elements of these airspace elements are described in Table 4.1-3.

Table 4.1-2. Description of MTRs

MTR	Altitudes		Route Width (In NM)[1]		Hours of Operation [2]	
	Min	*Max*	*Min*	*Max*	*From*	*To*
IR-900 IR-916 VR-1900 VR-1916	100 AGL	10,800 MSL 1,500 AGL	10	10	8:00 a.m.	8:00 p.m.
IR-909 IR-939 VR-1909 VR-1939	100 AGL	10,600 MSL 1,500 AGL	10	10	8:00 a.m.	8:00 p.m.
IR-952 IR-953 VR-954 VR-955	100 AGL	17,000 MSL 9,500 MSL	10	10	8:00 a.m.	8:00 p.m.
IR-922 IR-923 VR-940 VR-941	100 AGL	16,200 MSL	10	10	8:00 a.m.	8:00 p.m.
IR-919 IR-921 VR-937 VR-938	100 AGL	14,700 MSL	10	10	8:00 a.m.	8:00 p.m.
IR-917 IR-918 VR-935 VR-936	100 AGL	10,600 MSL 9,500 MSL	10 5.5	10	8:00 a.m.	8:00 p.m.
IR-903 IR-913 VR-933 VR-934	100 AGL	12,000 MSL	10	10	8:00 a.m.	8:00 p.m.
IR-962 IR-963 VR-960 VR-961	100 AGL	7,100 MSL	7	10	8:00 a.m.	8:00 p.m.
IR-972 IR-973 VR-970 VR-971	100 AGL	8,200 MSL	7	10	8:00 a.m.	8:00 p.m.
IR-902 IR-912 VR-1902 VR-1912	100 AGL	7,000 MSL 1,500 AGL	10	10	8:00 a.m.	8:00 p.m.
IR-905 IR-915 VR-1905 VR-1915	100 AGL	13,700 MSL 1,500 AGL	10	10	8:00 a.m.	8:00 p.m.
IR-901 IR-911 VR-931 VR-932	100 AGL	7,200 MSL 6,500 MSL	10	10	8:00 a.m.	8:00 p.m.

Notes: 1. NM = Nautical Miles (One Nautical Mile is approximately 6,077 feet)
2. Operating Days are Monday through Friday. All times are local times as normally scheduled.

Source: Air Force 2005a.

Table 4.1-3. Description of Restricted Airspace

Restricted Area	Altitudes		Hours of Use [1]		Controlling ARTCC
	Minimum	Maximum	From	To	
R-2202A	Surface	9,999 MSL[2]	6:00 a.m.	5:00 p.m.	Anchorage
R-2202B	Surface	9,999 MSL	6:00 a.m.	5:00 p.m.	Anchorage
R-2202C	10,000 MSL	Unlimited	By Notice to Airmen	Scheduled by Agreement	Anchorage
R-2203A[3]	Surface	11,000 MSL	5:00 a.m.	12:00 p.m.	Anchorage
R-2203B[3]	Surface	11,000 MSL	5:00 a.m.	12:00 p.m.	Anchorage
R-2203C[3]	Surface	5,000 MSL	5:00 a.m.	12:00 p.m.	Anchorage
R-2205	Surface	20,000 MSL	6:00 a.m.	6:00 p.m.	Fairbanks Approach
R-2206[4]	Surface	8,800 MSL	Continuous	Continuous	Anchorage
R-2211	Surface	18,000 MSL	7:00 a.m.	5:00 p.m.	Anchorage

Notes:
1. Days of use are Monday through Friday. All times are local times as normally scheduled.
2. MSL = Feet above mean sea level.
3. Ranges are not expected to be used by the F-22A.
4. Not used for training.

Range management involves the development and implementation of those processes and procedures required by Air Force Instruction (AFI) 13-212, Volumes 1, 2, and 3, to ensure that Air Force ranges are planned, operated, and managed in a safe manner, that all required equipment and facilities are available to support range use, and that proper security for range assets is present. Specific direction on different range activities is contained in AFI 13-212, Volume 1, *Range Planning and Operations*, Volume 2, *Range Construction and Maintenance*, and Volume 3, *SAFE-RANGE Program Methodology* (Air Force 2001c, 2001d, 2001e). The focus of range management is on ensuring the safe, effective, and efficient operation of Air Force ranges. The overall purpose of range management is to balance the military's need to accomplish realistic testing and training with the need to minimize potential impacts of such activities on the environment and surrounding communities (Air Force 2001c, 2001d, 2001e).

4.1.3 Environmental Consequences of Beddown

4.1.3.1 Proposed Action

Table 2.2-4 in Chapter 2.0 describes the existing and projected MOA usage associated with the proposed F-22A beddown. The combination of F-22A and F-15C training aircraft in the MOAs after a beddown is similar to the existing use by F-15C and F-15E aircraft. This change in use is not expected to affect regional or MOA airspace management. The usage of the airspace will not change to the extent that civil aviation could be affected. The time spent at higher altitudes by the F-22A, including in the ATCAAs, as compared with the F-15E, should have a minimally beneficial effect upon general aviation that generally flies at lower altitudes.

F-22A aircraft are projected to use some MTRs for limited low altitude training. F-22A use is approximately one-half the existing F-15E use. Table 2.2-5 presents existing F-15E and projected F-22A MTR use. This reduction in MTR activity should have minimal benefit to the extensive general aviation activity in Alaska.

Range use by the F-22A is substantially less than that of the F-15E. The F-22A is designed to carry smart munitions with long range stand-off capabilities. Most air-to-ground training in the

airspace would be performed by flying specific training profiles and practicing the release of munitions under launch conditions without releasing any munitions. Practice munition use projected for Alaskan training ranges would be performed at lower altitudes to experience the handling characteristics of the aircraft under deployment conditions. Table 2.2-6 compares existing F-15E and projected F-22A training munition use. None of the training activities within Alaskan SUA would be expected to result in any changes to airspace management from those existing for the F-15E and F-15C training. With regard to Airspace Management, the Proposed Action would not require any changes to how the airspace is currently managed. The mitigation in the 1995 MOA EIS ROD still applies (Air Force 1995). A series of studies were conducted as part of the MOA EIS. Dissemination of information was found to be an important element in explaining airspace management and use. For example, information boards along the Chena River in the state recreation area explain military aircraft training use of the overlying airspace.

Alaska Native Concerns

During scoping, Alaska Native members of several villages expressed concerns that the beddown of the F-22A could increase the risk of conflicts with small aircraft serving communities under special use airspace. As described above, existing awareness and avoidance procedures implemented by the Air Force, and standard FAA flight rules are designed to prevent airspace conflicts. These FAA rules require that all pilots are equally responsible to apply "see and avoid" techniques when operating an aircraft. As noted during scoping meetings, enhanced F-22A electronics and situational awareness are projected to reduce risks of conflicts with general aviation.

4.1.3.2 No Action

Existing MOA, MTR, range, and other airspace usage would not change with the No Action. Until Base Realignment and Closure (BRAC) was fully implemented, F-15Cs and F-15Es from Elmendorf AFB would continue to train in the airspace as they do today.

4.2 Noise

4.2.1 Definition

Within MOAs and overlying ATCAAs, subsonic flight is dispersed and often occurs randomly or, due to either airspace configuration or training scenarios, it may be concentrated or channeled into specific areas or corridors. The Air Force has developed the MR_NMAP (MOA-Range NOISEMAP) computer program (Lucas and Calamia 1996) to calculate subsonic aircraft noise in these areas. These computer programs calculate projected noise based on aircraft type, flight characteristics, meteorological conditions, and training activities. The models are based upon data collected under military airspace and represent the best data available for environmental evaluation. MR_NMAP can calculate noise for both random operations and operations channeled into corridors. The model results are supported by measurements in several military airspaces (Lucas *et al.* 1995). The affected airspace for Elmendorf AFB includes the MOAs in which training aircraft operate randomly throughout the airspace.

> L_{DNMR} is the monthly average of the Onset-Rate Adjusted Day-Night Average Sound Level (L_{DN}). Noise levels are interpreted the same way for both L_{DN} and L_{DNMR}. The annual sortie-operations for a MOA is divided by 12 to define monthly average sortie-operations. For this Draft EA, all training airspace noise levels were calculated using L_{DNMR}.

The primary noise metric calculated by MR_NMAP for this assessment is the Onset Rate Adjusted Day-Night Average Sound

Level (L_{dnmr}). This is an extension of the Day-Night Average Sound Level (L_{dn}, also denoted DNL), and accounts for the additional annoyance due to the rapid onset rate of noise from low-altitude high-speed aircraft. This quantity has been computed for each of the primary airspace units potentially affected by the Proposed Action and No Action Alternative. As discussed in Appendix D, this cumulative metric represents the most widely accepted method of quantifying noise impact. However, it does not provide an intuitive description of the noise environment. People often desire to know what the loudness of an individual aircraft will be; MR_NMAP and its supporting programs can provide the maximum sound level (L_{max}) (Table 4.2-1) and sound exposure level, Sound Exposure Level (SEL), (Table 4.2-2) that accounts for both the duration and intensity of a noise event for individual aircraft at various distances and altitudes. The L_{max} indicates the maximum noise level that would be heard by an individual as the aircraft flies overhead. SELs reflect the complete noise exposure as an aircraft flies by, accounting for both the level and duration of the sound. Both measures are described in Appendix D. These two tables demonstrate that, at comparable speeds, the F-15C and F-22A produce similar L_{max} and SEL noise levels.

Table 4.2-1. Representative A-Weighted Instantaneous Maximum (L_{MAX}) in Decibels Under the Flight Track for Aircraft at Various Altitudes in the Primary Airspace[1]

Aircraft Type	*Airspeed*	*Power Setting[3]*	*300 AGL*	*500 AGL*	*1,000 AGL*	*2,000 AGL*	*5,000 AGL*	*10,000 AGL*	*20,000 AGL*
F-15C	520	81% NC	119	114	107	99	86	74	57
F-22A[2]	520	70% ETR	120	116	108	99	85	71	54
F-16A	450	87% NC	112	108	101	93	80	67	50
F-18A	500	92% NC	120	116	108	99	85	71	54
F-14A	530	100% NC	115	111	103	94	80	67	51
B-1B	550	101% RPM	117	112	106	98	86	75	61

Notes: 1. Level flight, steady, high-speed conditions.
2. Projected based on F-22A composite aircraft.
3. Engine power setting while in a MOA. The type of engine and aircraft determines the power setting: RPM = rotations per minute, NC = percent core RPM, and ETR = engine throttle ratio.
AGL = above ground level

Table 4.2-2. Sound Exposure Level (SEL) in Decibels under the Flight Track for Aircraft at Various Altitudes in the Primary Airspace[1]

Aircraft Type	*Airspeed*	*300 AGL*	*500 AGL*	*1,000 AGL*	*2,000 AGL*	*5,000 AGL*	*10,000 AGL*	*20,000 AGL*
F-15C	520	116	112	107	101	91	80	65
F-22A[2]	520	118	114	108	101	89	77	62
F-16A	450	110	107	101	95	85	74	59
F-18A	500	118	114	108	101	89	77	62
F-14A	530	112	109	103	96	84	73	58
B-1B	550	116	112	107	101	92	82	70

Note: 1. Level flight, steady, high-speed conditions.
2. Projected based on F-22A composite aircraft.
AGL = above ground level

4.2.2 Existing Conditions

4.2.2.1 Subsonic Flight

Table 4.2-3 shows the baseline and projected noise levels for the MOAs currently used for F-15C and F-15E training and projected for use for F-22A training. F-22A environmental consequences are further discussed in Section 4.2.3. Figure 4.2-1 reproduces Figure 1.1-2. Cumulative noise levels in all airspace units are 57 L_{dnmr} or less. Subsonic noise levels in all primary airspace units are below 45 L_{dnmr}. Noise levels below 45 L_{dnmr} are presumed to be approximately at ambient levels. In the secondary MOAs, noise levels tend to be higher than in primary MOAs. This is due to the total number of sortie-operations by all aircraft, but the F-15Cs are minor contributors.

Comments received during scoping requested a comprehensive presentation of noise effects. Aircraft noise effects can be described according to two categories: annoyance and human health considerations. Annoyance, which is based on perception, represents the primary effect associated with aircraft noise. Far less potential exists for effects on human health.

Studies of community annoyance to numerous types of environmental noise show that L_{dn}/L_{dnmr} correlates well with effects, and Schultz (1978) showed a consistent relationship between noise levels and annoyance. A more recent study reaffirmed and updated this relationship (Fidell *et al.* 1991). The updated relationship, which does not differ substantially from the original, is the current preferred form (see Appendix D).

In general, there is a high correlation between the percentages of groups of people highly annoyed and the level of average noise exposure measured in L_{dn}/L_{dnmr}. The correlation is lower for the annoyance of individuals. This is not surprising considering the varying personal factors that influence the manner in which individuals react to noise. The inherent variability between individuals makes it impossible to predict accurately how any individual will react to a given noise event. Nevertheless, findings substantiate that community annoyance to aircraft noise is represented quite reliably using L_{dn}.

Relation Between Annoyance and L_{dn}

L_{dn}/L_{dnmr}	*CDNL*	*% Population Highly Annoyed*
40	40	0.4
45	44	0.8
50	48	1.7
55	52	3.3
60	57	6.5

4.2.2.2 Supersonic Flight

Supersonic flight for fighter aircraft is primarily associated with air combat training. Supersonic activity is authorized in the MOAs under specific altitude restrictions. Supersonic flight produces an air pressure wave that may reach the ground as a sonic boom. The amplitude of an individual sonic boom is measured by its peak overpressure, in pounds per square foot (psf) and depends on an aircraft's size, weight, geometry, Mach number, and flight altitude. Table 4.2-4 shows sonic boom overpressures for the F-15C and F-22A aircraft in level flight at various conditions. The biggest single condition affecting overpressure is altitude. Maneuvers can also affect boom peak overpressures, increasing or decreasing overpressures from those shown in Table 4.2-4 (also see Appendix D).

Table 4.2-3. Baseline and Projected Noise Levels

	MOA/ATCAA	*Noise Measure*	*Baseline*	*Projected*
Primary Airspace	Galena[1]	L_{dnmr}	26	24.7
		CDNL	N/A	N/A
		Booms/Month	N/A	N/A
	Naknek 1/2[1]	L_{dnmr}	30.4	30.6
		CDNL	33.6	45.1
		Booms/Month	.3	3.7
	Stony A/B[2]	L_{dnmr}	39.9	38.4
		CDNL	51.2	53.9
		Booms/Month	15.0	27.8
	Susitna[3]	L_{dnmr}	42.3	41.0
		CDNL	N/A	N/A
Secondary Airspace	Birch[1]	L_{dnmr}	47.6	47.6
		CDNL	50	50
		Booms/Month	11.3	11.4
	Buffalo[1]	L_{dnmr}	42.0	41.9
		CDNL	50.2	50.3
		Booms/Month	11.9	12.2
	Eielson[1]	L_{dnmr}	47.5	47.3
		CDNL	52.2	52.5
		Booms/Month	18.9	20
	Fox 1/2/3[5]	L_{dnmr}	40.5	39.2
		CDNL	52.2	53.1
		Booms/Month	19	23.2
	Yukon 1[5]	L_{dnmr}	40.7	40.3
		CDNL	52.1	52.5
		Booms/Month	18.5	20.4
	Yukon 2[5]	L_{dnmr}	38.7	38.4
		CDNL	51.4	51.8
		Booms/Month	15.8	17.3
	Yukon 3[5]	L_{dnmr}	38.8	37.9
		CDNL	49.8	50.8
		Booms/Month	10.8	13.6
	Yukon 4[5]	L_{dnmr}	39	38.5
		CDNL	49.9	50.5
		Booms/Month	11.1	12.7
	Yukon 5[5]	L_{dnmr}	37.7	37.2
		CDNL	47.6	48.2
		Booms/Month	6.5	7.5
	Viper[4]	L_{dnmr}	56.5	56.5
		CDNL	N/A	N/A

Notes:
1. ATCAAs supersonic approved above 30,000 MSL.
2. Supersonic approved above 10,000 MSL or 5,000 AGL (whichever is higher).
3. Supersonic approved ONLY for Functional Check Flights above 12,000 MSL or 5,000 AGL (whichever is higher) on an East-West line south of Denali Reserve.
4. Supersonic not approved.
5. Supersonic approved above 12,000 MSL or 5,000 AGL (whichever is higher).

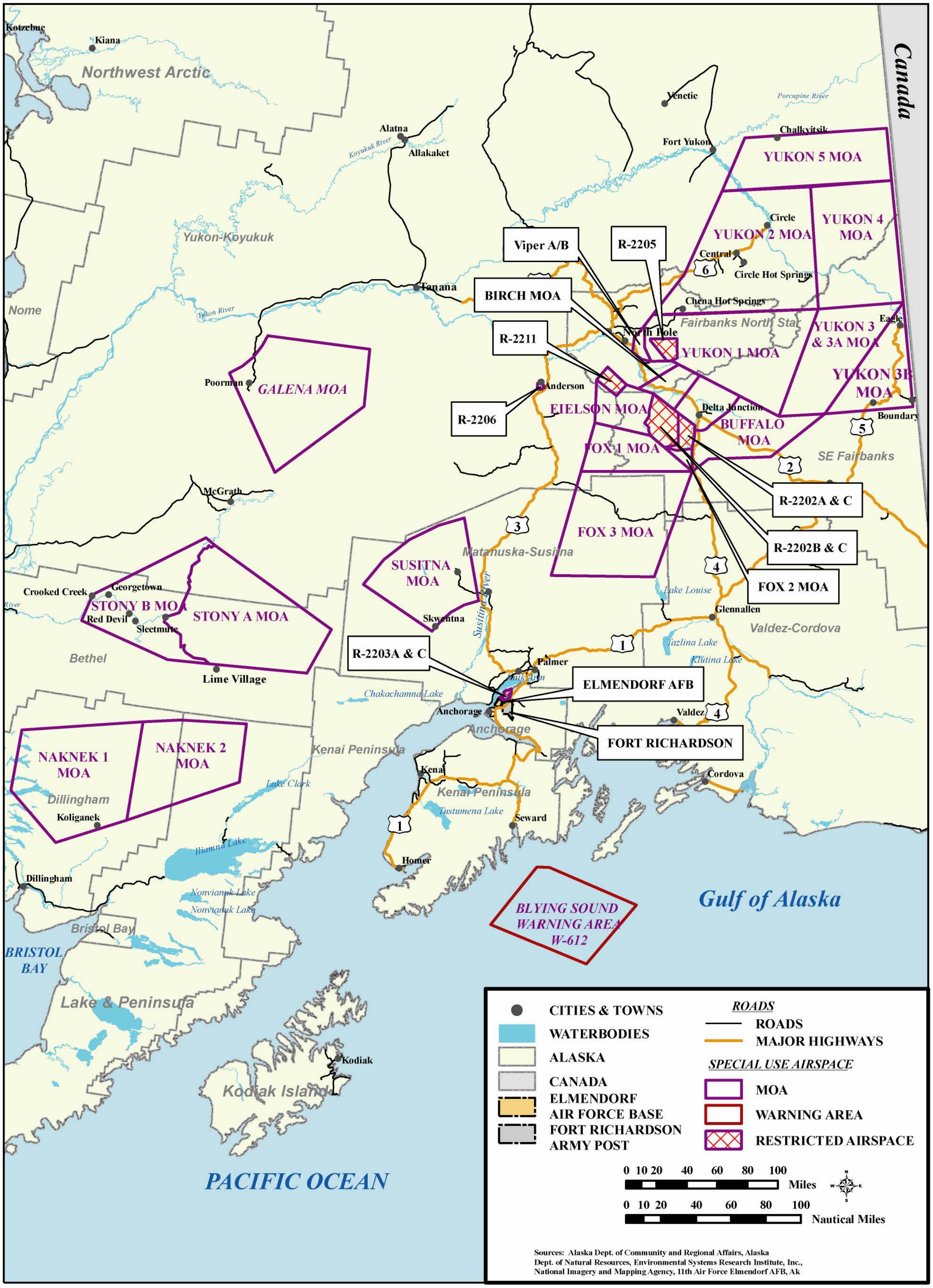


Figure 4.2-1. Training Special Use Airspace

Table 4.2-4. Sonic Boom Peak Overpressures (psf) for F-15 and F-22A Aircraft at Mach 1.2 Level Flight

Aircraft	**Altitude (feet)**			
	10,000	***20,000***	***30,000***	***40,000***
F-15C	5.40	2.87	1.90	1.46
F-22A	5.68	3.00	1.97	1.50

Community effects from sonic booms, in the form of annoyance, correlates well with the C-weighted Day-Night Average Noise Level (CDNL). CDNL is similar to L_{dn}, but uses C-weighting to account for the low frequency impulsive nature of sonic booms. Interpretation of CDNL uses a slightly different relation than interpretation of L_{dn}, with a given numeric value of CDNL generally representing more annoyance than the same numeric value of L_{dn}.

Aircraft exceeding Mach 1 always create a sonic boom, although not all supersonic flight activities will cause a boom at the ground. As altitude increases, air temperature decreases, and the resulting layers of temperature change, causing booms to be turned upward as they travel toward the ground.

Depending on the altitude of the aircraft and the Mach number, many sonic booms are bent upward sufficiently that they never reach the ground. This same phenomenon, referred to as "cutoff," also acts to limit the width (area covered) of the sonic booms that reach the ground (Plotkin *et al*. 1989).

When a sonic boom reaches the ground, it impacts an area which is referred to as a "footprint" or (for sustained supersonic flight) a "carpet." The size of the footprint depends on the supersonic flight path and on atmospheric conditions. Sonic booms are loudest near the center of the footprint, with a sharp "bang-bang" sound. Near the edges, they are weak and have a rumbling sound like distant thunder.

Sonic booms from air combat training activity have an elliptical pattern. Aircraft will set up at positions up to 100 nautical miles apart before proceeding toward each other for an engagement. The airspace used tends to be aligned, connecting the setup points in an elliptical shape. Aircraft will fly supersonic at various times during an engagement exercise. Supersonic events can occur as the aircraft accelerate toward each other, during dives in the engagement itself, and during disengagement. The long-term average (C-weighted Day-Night Average Sound Level [CDNL]) sonic boom patterns also tend to be elliptical.

Long-term sonic boom measurement projects have been conducted in four airspaces: White Sands, New Mexico (Plotkin *et al.* 1989); the eastern portion of the Goldwater Range, Arizona (Plotkin *et al.* 1992); the Elgin MOA at Nellis AFB, Nevada (Frampton *et al.* 1993); and the western portion of the Goldwater Range (Page *et al.* 1994). These studies included analysis of schedule and air combat maneuvering instrumentation data, and they supported development of the 1992 BooMap model (Plotkin *et al.* 1992). The current version of BooMap (Frampton *et al.* 1993; Plotkin 1996) incorporates results from all four studies. Because BooMap is directly based on long-term measurements, it implicitly accounts for maneuvers, statistical variations in operations, atmospheric effects and other factors.

A variety of aircraft conducting training perform flight activities that include supersonic events. For most fighter aircraft, these events occur during air-to-air combat, often at high altitudes. On

average, F-15Cs fly supersonic about 7.5 percent of the time with Mach numbers usually 1.1 or less, but occasionally up to about 1.3. This is typical of all the current-generation supersonic aircraft studied in the development of BooMap. Table 4.2-3 shows baseline supersonic noise levels and sonic booms, CDNL, in affected airspace.

Table 4.2-3 also provides the estimated number of booms per month that would be generated at an average location in each airspace. Individual sonic boom footprints could affect areas from about 10 square miles to 100 square miles.

4.2.3 Environmental Consequences of Beddown

Proposed F-22A flight activities would not increase subsonic noise levels in any of the primary or secondary MOAs since sortie operations change little under the Proposed Action (refer to Table 2.2-1). In all primary MOAs, subsonic noise levels would not discernibly change (Table 4.2-3). F-22As would fly, on average, 80 percent of the time above 10,000 feet MSL, and 30 percent of the total time would be spent above 30,000 feet MSL. The higher altitude of the F-22A training sorties would produce no perceptible change in subsonic noise.

F-22A training in the MOAs and ATCAAs will take advantage of the F-22A enhanced supersonic capability relative to the F-15C and F-15E. The F-22A is projected to spend 25 percent of training time at or above supersonic speeds. For comparison, the F-15C is estimated to spend 7.5 percent of training time at supersonic speeds. This means that during a typical 14-minute air-to-air engagement, the F-22A would be supersonic 3 to 4.5 minutes, while the F-15C would be supersonic 1 to 2 minutes. The F-22A would also commonly achieve Mach numbers up to about 1.3, versus 1.1 for the F-15C. The majority of F-15C or F-15E supersonic activity is below 30,000 feet, while 60 percent of F-22A supersonic activity would be above 30,000 feet. Although the extent of the sonic boom footprint generated by an F-22A is larger than that generated by an F-15, the actual overpressure (psf) experienced on the ground is only about 75 percent of that resulting from an F-15 boom because on the ground booms generated at high altitude are weaker than those at low altitude. These factors for the F-22A are accounted for in BooMap.

Table 4.2-3 presents the baseline and projected sonic booms per month for each airspace. Lands under each airspace approved for supersonic training currently experience sonic booms. Under most airspaces, the monthly number of sonic booms would increase. Under the Naknek MOAs, the number of sonic booms would increase from an average of 1 every 3 months to an average of 4 per month. Overall, sonic booms toward the center of Stony A/B would be projected to increase by 13 booms per month; in the Fox MOA, monthly booms would increase by 4. Yukon 1 and 2 would experience an increase of 2 booms per month, while Yukon 3, 4, and 5 would experience an increase of 1 to 3 booms per month.

The F-22A beddown at Elmendorf AFB and training in existing Alaskan airspace will not have a discernible effect on subsonic noise over baseline conditions. The enhanced supersonic performance of the F-22A which contributes to its success in combat results in increased sonic booms on lands under the training airspace.

With existing sonic booms under the airspace, an increase of 1 to 4 booms per month is not likely to be perceived even by persons who spend extended periods out of doors under the airspace. This would be the case with all MOAs with the exception of the Stony MOAs.

Under the Stony MOAs, particularly toward the center of the airspace, the number of booms per month is projected to increase from the current 15 to a projected 28. This estimated change from an average of 1 every other day to an average of almost 1 per day is likely to be noticed by residents or long-term visitors. Such a change in sonic events would not be expected to affect human health or have an effect upon game or other animals which have experienced sonic booms for most of their lifetimes. However, if perceived, such a change could increase the number of highly annoyed individuals from an existing approximately 3 percent of the population to an estimated approximately 5 percent of the population under the airspace (see Appendix D).

Tables 4.2-1 and 4.2-2 demonstrate noise levels for the F-15C (comparable with the F-15E) and F-22A at the same airspeed on an MTR. The L_{max} and SEL levels are within 1 to 2 dB at all altitudes above 500 feet. On an MTR, the F-22A would not fly at speeds greater than the F-15E and is not expected to fly below 500 feet AGL. The near identical aircraft dB levels and the reduction of MTR use by 50 percent with the F-22A would result in reduced noise along the Alaskan MTRs.

Alaska Native Concerns

Noise was mentioned as a concern by Alaska Natives during scoping. Some expressed concerns that the F-22A could disrupt traditional subsistence activities associated with their communities, impact wildlife populations, or disrupt traditional cultural practices. As detailed above, subsonic noise would not change under the primary and secondary MOAs. In most areas, the number of sonic booms would increase by no more than 1 to 4 booms per month. Depending upon the extent of seasonal residents or long-term visitors to lands under the Stony MOAs, some individuals, especially those located toward the center of the airspace, would likely notice an increase from the existing 15 to the projected 28 booms per month. This change would likely be discernible to Alaska Natives or others residing under or using the land under the airspace for an extended period of time. For any damage claims associated with sonic booms, the Air Force has established procedures that begin with contacting the Elmendorf AFB Public Affairs Office.

4.2.4 No Action

No Action means that the beddown of the F-22A at Elmendorf AFB would not occur at this time. Until the BRAC schedule was implemented, F-15C and F-15E aircraft would continue to train in the airspace. The existing conditions include the presence of military aircraft in the airspace and the number of sonic booms estimated for baseline conditions on Figure 3.2-2.

4.3 Safety

4.3.1 Definition

Safety is the conduct of flight training within the Alaskan airspace in a manner that protects other users of the area, as well as military pilots. Elmendorf AFB has existing programs and guidance to support safe operations and reduce risks associated with training in Alaskan airspace (Air Force 1995; Elmendorf AFB 2003; 3rd Wing [3 WG] 2004). This section addresses flight, ground, explosive, and other safety issues associated with 3 WG aircrew use of the regional military training airspace and its supporting assets and facilities.

4.3.2 Existing Conditions

4.3.2.1 Flight Safety

As noted in Section 3.3, Elmendorf AFB F-15Cs and F-15Es have a low number of Class A mishaps. Since mishaps tend to occur more frequently around airfields and in low-altitude flight regimes, it is impossible to predict the precise location of an aircraft accident, should one occur. Major considerations in any accident are loss of life and damage to property. The aircrew's ability to exit from a malfunctioning aircraft is dependent on the type of malfunction encountered. The probability of an aircraft crashing into a populated area is extremely low, but it cannot be totally discounted. Several factors are relevant in the ROI: the immediate surrounding areas have relatively low population densities; pilots of aircraft are instructed to avoid direct overflight of population centers at very low altitudes; and, finally, the limited amount of time the aircraft is over any specific geographic area limits the probability that impact of a disabled aircraft in a populated area would occur.

Secondary effects of an aircraft crash include the potential for fire or environmental contamination. Again, because the extent of these secondary effects is situationally dependent, they are difficult to quantify. The terrain overflown in the ROI is diverse. For example, should a mishap occur in highly vegetated areas during a hot, dry summer, such a mishap would have a higher risk of extensive fires than would a mishap in more barren and rocky areas during the winter. When an aircraft crashes, it may release hydrocarbons. Those petroleums, oils, and lubricants not consumed in a fire could contaminate soil and water. The potential for contamination is dependent on several factors. For example, the porosity of the surface soils will determine how rapidly contaminants are absorbed, while the specific geologic structure in the region will determine the extent and direction of the contamination plume. The locations and characteristics of surface and groundwater in the area will also affect the extent of contamination to those resources.

Based on historical data on mishaps at all installations, and under all conditions of flight, the military services calculate Class A mishap rates per 100,000 flying hours for each type of aircraft in the inventory. These mishap rates do not consider combat losses due to enemy action.

As noted in Section 2.2.1, MTR use by F-22A aircraft is projected to be less than 40 percent of existing F-15E usage. This lower use could minimally reduce any risks of low altitude accidents.

In the case of MOAs, for each specific aircraft using the airspace an estimated average sortie duration may be used to estimate annual flight hours in the airspace. Then, the Class A mishap rate per 100,000 flying hours can be used to compute a statistical projection of anticipated time between Class A mishaps in each applicable element of airspace. In evaluating this information, it should be emphasized that those data presented are only statistically predictive. The actual causes of mishaps are due to many factors, not simply the amount of flying time of the aircraft.

Table 4.3-1 presents statistically projected Class A mishap data for flight operations conducted in the regional MOAs. Shown for each airspace element are the aircraft using the airspace, the mishap rate for that aircraft, the number of annual operations for those aircraft, the levels of use, and the statistically predicted time between mishaps considering the mishap rates and levels of use.

Table 4.3-1. Projected Class A Mishaps (Current Operations) (Page 1 of 2)

Airspace[1]	*Aircraft*	*Mishap Rate*	*Annual Operations*	*Annual Hours*	*Years Between Projected Mishaps*
Galena	F-15C	2.46	84	42	967.9
	F-15E	2.02	42	21	2,357.4
Naknek 1/2	F-15C	2.46	390	195	208.5
	F-15E	2.02	192	96	515.7
Stony A/B	F-15C	2.46	3,327	1,663.5	24.4
	F-15E	2.02	1,638	819	60.4
Susitna	F-15C	2.46	1,908	954	42.6
	F-15E	2.02	940	470	105.3
Birch	F-15C	2.46	8	4	10,162.6
	F-15E	2.02	4	2	24,752.5
	F-16	3.98	2,220	1,110	22.6
	A-10	2.36	1,542	771	55.0
Buffalo	F-15C	2.46	22	11	3,695.5
	F-15E	2.02	11	5.5	9,000.9
	F-16	3.98	2,320	1,160	21.7
	A-10	2.36	1,612	806	52.6
Eielson	F-15C	2.46	88	44	923.9
	F-15E	2.02	44	22	2,250.2
	F-16	3.98	3,636	1,818	13.8
	A-10	2.36	2,527	1,263	33.5
Fox 1/2/3	F-15C	2.46	320	160	254.1
	F-15E	2.02	160	80	618.8
	F-16	3.98	3,444	1,722	14.6
	A-10	2.36	2,393	1,197	35.4
Yukon 1	F-15C	2.46	146	73	556.9
	F-15E	2.02	73	36.5	1,356.3
	F-16	3.98	3,505	1,753	14.3
	A-10	2.36	2,436	1,218	34.8
Yukon 2	F-15C	2.46	116	58	700.9
	F-15E	2.02	58	29	1,707.1
	F-16	3.98	2,999	1,499	16.8
	A-10	2.36	2,084	1,042	40.7

Table 4.3-1. Projected Class A Mishaps (Current Operations) (Page 2 of 2)

Airspace[1]	*Aircraft*	*Mishap Rate*	*Annual Operations*	*Annual Hours*	*Years Between Projected Mishaps*
Yukon 3 A/B	F-15C	2.46	215	107.5	378.1
	F-15E	2.02	108	54	916.8
	F-16	3.98	1,933	967	26.0
	A-10	2.36	1,344	672	63.1
Yukon 4	F-15C	2.46	123	61.5	661.0
	F-15E	2.02	62	31	1,596.9
	F-16	3.98	2,069	1,034	24.3
	A-10	2.36	1,437	719	59.0
Yukon 5	F-15C	2.46	76	38	1,069.7
	F-15E	2.02	38	19	2,605.5
	F-16	3.98	1,212	606	41.4
	A-10	2.36	843	421	100.6
Viper[2]	F-15C	2.46	0	N/A	N/A
	F-15E	2.02	0	N/A	N/A
	F-16	3.98	3,629	1,815	13.8
	A-10	2.36	2,522	1,261	33.6

Notes: 1. W612 is an offshore warning area not included in the mishap analysis because it is not scheduled for regular F-22A training.
2. Viper A/B are divided at 10,000 feet MSL.
N/A = Not Applicable
Source: Air Force Safety Center 2006

As shown, the greatest risk associated with F-15C aircraft occurs in the Stony MOAs; for F-15E aircraft in the Stony MOAs; for F-16 aircraft in the Eielson and Viper MOAs; and, for A-10 aircraft in the Eielson MOA.

The F-22A is a new aircraft and has accumulated very few flight hours. For example, F-15 aircraft, which have been flown since 1972, have accumulated more than 4,998,100 flight hours. By comparison, as of early 2006, F-22A aircraft have flown only 3,246 hours (Air Force Safety Center 2006). Since mishap rates are statistically assessed as an occurrence rate per 100,000 flying hours, low use levels substantially influence the mishap rate. It is reasonable to expect that as the F-22A weapon system matures, its rates will be as low as, or lower than the F-15's current rates.

The 3 WG maintains detailed emergency and mishap response plans to react to an aircraft accident, should one occur. These plans assign agency responsibilities and prescribe functional activities necessary to react to major mishaps, whether on or off base. Response would normally occur in two phases. The initial response focuses on rescue, evacuation, fire suppression, safety, elimination of explosive devices, ensuring security of the area, and other actions immediately necessary to prevent loss of life or further property damage. Subsequently, the second, or investigation phase is accomplished.

First response to a crash scene is often provided by local emergency services nearest the scene. At the same time, the Air Force rapidly mobilizes a response team. The initial response element consists of those personnel and agencies primarily responsible to initiate the initial phase. This element will include the Fire Chief, who will normally be the first On-Scene Commander, fire-fighting and crash rescue personnel, medical personnel, security police, and crash recovery personnel. A subsequent response team will be comprised of an array of organizations whose participation will be governed by the circumstances associated with the mishap and actions required to be performed.

The Air Force has no specific rights or jurisdiction just because a military aircraft is involved. Regardless of the agency initially responding to the accident, efforts are directed at stabilizing the situation and minimizing further damage. If the accident has occurred on non-federal property, and depending on the nature of the accident, a National Defense Area would probably be established around the accident scene and the site will be secured for the investigation phase.

After all required actions on the site are complete, the aircraft will be removed and the site cleaned up. Depending on the extent of damage resulting from a Class A mishap, only the largest damaged parts may be located and removed from a crash site.

Activities of F-15Cs and F-15Es in the MOAs do not have a high potential for mishaps. Additionally, the potential for bird-aircraft strikes in the MOAs is negligible because the F-15Cs and F-15Es fly 90 percent of the time at altitudes above the zone (0 to 3,000 feet above ground level [AGL]) where 95 percent of strikes occur.

Flight safety includes the potential for interaction between general aviation and high performance military aircraft. Actions that have been implemented by Elmendorf AFB to reduce training flight activity in MOAs during hunting season reduce the potential for military aircraft being in a MOA while general aviation aircraft are ferrying hunters or fisherman. Discussions during scoping with pilots, hunters, fishermen, and recreationists flying to use the

land under the MOAs revealed that, although they occasionally sighted a military aircraft, they generally flew at lower altitudes than the military aircraft and both pilots practiced see-and-avoid measures. Elmendorf AFB pilots have been able to safely train while being joint users of Alaskan airspace.

4.3.2.2 Ground and Explosive Safety

Aircrews from Elmendorf AFB train on air-to-ground ranges. Air-to-ground expenditure of munitions during training is limited to ranges within Restricted Airspace. As noted in Table 2.2-6, there would be a net decrease in munitions use associated with F-22A training. Air Force safety standards require safeguards on weapons systems and ordnance to ensure against inadvertent releases. All munitions mounted on an aircraft, as well as the guns, are equipped with mechanisms that preclude release or firing without activation of an electronic arming circuit.

When live (high-explosive) ordnance impacts a target, it detonates, and the effects of this detonation are blast and overpressure in the immediate vicinity of the target. When a training (inert) air-to-ground weapon impacts on or near the target, it may skid, bounce, or burrow under the ground for some distance from the point of impact, coming to rest at some distance from that point. The military services have analyzed extensive historic data on ordnance and incorporated those data into a computer program (called SAFE-RANGE). SAFE-RANGE considers the type of ordnance, the aircraft, the delivery profile, the target type, as well as other data such as the demonstrated accuracy of the aircraft's bombing and navigation system. The program then calculates an area around the target within which either effects from live ordnance will spread, or the specific training or inert ordnance under consideration will come to rest. This area has dimensions in front of, behind, and on either side of the target. The results reflect (at a 95 percent confidence level) the geographic area which will contain 99.99 percent of the specific weapon's deliveries and their effects (Air Force 2001a).

Operations conducted by 3 WG aircrews have been subjected to these analyses, and detailed operating procedures published by the air-to-ground ranges that support 3 WG training ensure that all safety standards are met for the type of ordnance delivered, and the delivery profile associated with that ordnance delivery.

4.3.2.3 Chaff and Flare Use

Chaff and defensive flares are managed as ordnance. Chaff and flares are authorized for use by 3 WG crews. Use is governed by detailed operating procedures to ensure safety.

Chaff, which is ejected from an aircraft to reflect radar signals, is small fibers of aluminum-coated silica packed into approximately 4-ounce bundles. When ejected, chaff forms a brief electronic "cloud" that temporarily masks the aircraft from radar detection. Although the chaff may be ejected from the aircraft using a small pyrotechnic charge, the chaff itself is not explosive (Air Force 1997). During fiscal year (FY) 2005, 3 WG aircrews expended 34,869 bundles of chaff (personal communication, Norby 2005). Two 1-inch by 1-inch plastic or nylon pieces and one 1-inch by 1-inch felt piece fall to the ground with each released chaff bundle. Appendix A provides an expanded discussion of chaff.

Defensive training flares consist of small pellets of highly flammable material that burn rapidly at extremely high temperatures. Their purpose is to provide a heat source other than the aircraft's engine exhaust to mislead heat-sensitive or heat-seeking targeting systems and decoy

them away from the aircraft. The flare, essentially a pellet of magnesium, ignites upon ejection from the aircraft and burns completely within approximately 3.5 to 5 seconds, or approximately 400 feet from its release point (Air Force 1997). During FY 2005, 3 WG aircrews expended 21,313 flares (personal communication, Norby 2005).

The existing use of flares as defensive countermeasures results in small plastic, nylon, and aluminum-coated mylar pieces falling to the ground. As discussed in Appendix B, Characteristics of Flares and Appendix E, Review of Effects of Aircraft Noise, Chaff, and Flares on Biological Resources, flare residual materials are generally light with a high surface to weight ratio. This results in essentially no likelihood of a flare end cap, piston, or wrapper causing injury in the highly unlikely event residual material from a flare struck a person or an animal. The only exception is the flare safe and initiation (S&I) device which falls with the force of a medium-sized hailstone. Calculations of the likelihood of an S&I device striking an individual take into consideration the population density under the airspace, the number of flares deployed, and the amount of time the population was outside and unprotected even by a hat.

If, for example, a population has an average density of 0.5 persons per square mile and is exposed 50 percent of the time under an airspace the size of the Stony MOA, and if 8,000 flares were deployed annually in the airspace, the expected strikes to a person would be 1 in 4,000 years. In other words, it is extremely unlikely that anyone would be struck with the force of a medium-sized hailstone as a result of Air Force training with flares in the airspace.

Concerns have also been expressed that a flare has the potential to start a fire if a flare were still burning when it hit the ground. As described in Chapter 2.0, flares burn out in approximately 400 feet. Air Force altitude restrictions for flare use in Alaskan airspace (above 5,000 feet AGL June – September and above 2,000 feet AGL for the rest of the year) substantially reduce any risk of a fire from training with defensive flares.

4.3.3 Environmental Consequences of Beddown

Aircraft safety and bird-aircraft strikes are not expected to measurably differ from baseline conditions for the Proposed Action. All safety actions that are in place for existing F-15C and F-15E training will continue to be in place for F-22A training. These actions include scheduling to avoid, to the extent possible, high general aviation use of MOA airspace and altitude restrictions on flare use. Aircraft safety within the training airspace could even be enhanced by the improved radars and situational awareness provided by the F-22A systems.

Past scoping concerns in Alaska included the potential for an aircraft mishap at the seismic observatory at Burnt Mountain and the potential of radioactive materials escaping the facility in case of such an accident. The likelihood of a Class A mishap at one specific point is extremely low. Unrelated to any F-22A decision, the Air Force entered into a prior agreement with the state of Alaska to use alternative energy sources at the observatory.

Introduction of the F-22A into the training airspace would have no change in chaff or flare use. There would be no change in safety under the training airspace.

Each chaff used for F-22A training also releases three 2-inch by 4-inch mylar strips in addition to the plastic and felt pieces. This mylar material is similar to the material that wraps flares. Both the chaff and the flare mylar pieces are expected to disintegrate over an Alaskan season. No cases of animals ingesting such materials have been recorded, and under arid range areas

where chaff and flares have been used for decades, pack rat nests have not been found to contain chaff or flare materials (Air Force 1997). No safety consequences from continued chaff and flare use are anticipated.

Alaska Native Concerns

A number of Alaska Native villages and traditional subsistence areas underlie Alaskan SUA. Based on past indications and scoping comments for this EA, Alaska Natives may be concerned about potential conflicts between military and private aircraft using the same airspace. Additionally, the potential for aircraft or munitions mishaps and the impacts on the underlying areas are of concern. As noted above, the F-22A pilot's improved situational awareness and the reduction in munitions use are expected to minimally improve safety within the airspace.

4.3.4 No Action

The existing conditions for aircraft flight safety, mishaps, and chaff and flare residuals would remain with the No Action Alternative.

4.4 Air Quality

4.4.1 Definition

Prevention of Significant Deterioration. Section 162 of the Clean Air Act (CAA) further established the goal of Prevention of Significant Deterioration (PSD) of air quality in all international parks; national parks which exceeded 6,000 acres; and national wilderness areas and memorial parks which exceeded 5,000 acres if these areas were in existence on August 7, 1977. These areas were defined as mandatory Class I areas, while all other attainment or unclassifiable areas were defined as Class II areas. Under CAA Section 164, states or tribal nations, in addition to the federal government, have the authority to redesignate certain areas as (non-mandatory) PSD Class I areas, e.g., a national park or national wilderness area established after August 7, 1977, which exceeds 10,000 acres. PSD Class I areas are areas where any appreciable deterioration of air quality is considered significant. Class II areas are those where moderate, well-controlled growth could be permitted. Class III areas are those designated by the governor of a state as requiring less protection than Class II areas. No Class III areas have yet been so designated. The PSD requirements affect construction of new major stationary sources in the PSD Class I, II, and III areas and are a pre-construction permitting system.

4.4.2 Existing Training

In Alaska, alternative forms of transportation and energy generation are a necessity given the isolated nature of many towns and villages. In terms of ground transportation, all-terrain vehicles (ATVs or 4-wheelers) replace the automobile in the warmer weather months and snow machines take their place as soon as the snow falls. These engines, as well as diesel generators used to produce electricity, contribute to the air emissions of the region. When reviewing the overall air quality of an area, consideration of these forms of exhaust emissions is important.

The likelihood for air quality impacts associated with airspace use was evaluated based on the floor height of the primary MOAs relative to the mixing height for pollutants. For the area of the primary MOAs, the mixing height is 2,000 feet. The affected environment for Elmendorf AFB training airspace includes two primary MOAs (Stony A and Galena) where flight activities would occur below the average mixing height of 2,000 feet. Table 4.4-1 summarizes baseline emissions from flight operations in these two MOAs. In these two MOAs, F-15Cs fly

approximately 8 percent or less of the time below the mixing height. While the secondary MOAs permit flight below the mixing height, the amount of activity by F-15Cs (or F-22As) is minimal compared to the overall use. Such low levels of sortie-operations would not contribute measurably to overall emissions.

Table 4.4-1. Baseline and Projected Emissions for Affected Alaskan SUA

	Baseline Emissions (tons/year)				
Affected Airspace[1]	*CO*	*VOCs*	*NO_x*	*SO_2*	*PM_{10}*
Galena MOA	0.015	0.005	0.60	0.001	0.001
Stony A MOA	1.16	0.35	42.52	0.10	0.14
	Projected Emissions (tons/year)				
Galena MOA	0.005	0.002	0.19	0.001	0.001
Stony A MOA	0.49	0.13	15.75	0.05	0.13

Note: 1. Airspace units with a floor below 2,000 feet AGL (mixing height).
CO = carbon monoxide; VOC = volatile organic compound; NO_x = nitrogen oxides; SO_2 = sulfur dioxide; PM_{10} = particulate matter less than 10 micrometers in diameter

4.4.3 Environmental Consequences of Beddown

Table 2.2-4 describes the existing and projected usage of the military training airspace under the Proposed Action. As discussed in Section 4.1.3.1, the projected change in aircraft operations represents an approximate 5 to 10 percent increase from the current use by the F-15Cs. Emission concentrations associated with F-22A aircraft operations would be minimal due to the flight altitudes and large size of the airspace units. Because these emissions would be dispersed over millions of acres, they would not measurably affect air quality (refer to Table 4.4-1). Emissions would decrease in both of the MOAs with floors below the mixing height (Galena and Stony A MOAs). These decreases would result from the lower amount of flying time F-22As would spend at altitudes below the mixing height compared to F-15Cs. This increase in flight altitude offsets potential emission increases from increased F-22A sortie-operations and higher F-22A aircraft emissions.

Of the primary MOAs, only operations within the Susitna MOA overlie a PSD Class I area: the Denali National Park and Preserve, where visibility must be protected and preserved. However, the floor of the Susitna MOA is 5,000 feet AGL or 10,000 feet MSL (whichever is greater). All operations in this MOA are above the mixing height and, therefore, would not affect air quality.

Alaska native Concerns

Emissions from aircraft operations would be transitory and dispersed over the extensive Alaskan SUA. Residents and visitors to Alaska Native villages and traditional subsistence areas underlying this airspace would not be able to detect any improvement in emissions associated with the Proposed Action.

4.4.4 No Action

Under the No Action Alternative, aircraft operations would not change from current conditions. Therefore, there would be no change to the current air quality.

4.5 Physical Resources

4.5.1 Definition

Physical resources are defined as the earth and water resources beneath the 18 MOAs and Restricted Areas that comprise the airspace used for air-to-air and air-to-ground training by the F-15C and F-15E and that are proposed for continued use by the F-22A. This 38.5 million acres of diverse geologic and hydrologic features can be separated into three generalized physiographic regions: the Interior, South Central, and Western regions.

4.5.2 Existing Conditions

Earth resources beneath the training airspace extend from the Brooks Range on the north to the Alaska Range in the interior part of the state. The airspace also covers a 650-mile arc from the Alaska Range almost to the Gulf of Alaska. The western portion of the airspace extends in a 150-mile swath from just south of the Yukon River at Galena to 50 miles north of Dillingham on Bristol Bay.

Portions of the Yukon MOA overlie the Porcupine Plateau, an area characterized by low ridges with gentle slopes and summits 1,500 to 2,500 feet high with a few 3,500-foot peaks. Valley floors are broad and valley patterns irregular, with many imperceptible divides. The central part of the Yukon and Viper MOAs (Yukon 1, 2, 3, 4, and Viper A/B) overlies the Yukon Flats region (Air Force 1995). The Yukon Flats region consists of marshy lake-dotted flats rising from 300 feet in altitude on the west to 600 to 900 feet on the north and east. The northern part of the flats is made up of gently sloping outwash fans of the Chandalar, Christian, and Sheenjek Rivers. The southeastern part of the flats is the broad gentle outwash fan of the Yukon River. Other areas are flat floodplains. Rolling silt and gravel-covered marginal terraces having sharp escarpments 150 to 600 feet high rise above the flats and slope gradually up to altitudes of about 1,500 feet at the base of surrounding uplands and mountains (U.S. Geological Survey [USGS] 2000). The southern portion of the Yukon MOA Complex (Yukon 1, 2, 3, 4, and 5, R-2205, and portions of the Birch, Buffalo and Eielson MOAs) overlies the Yukon-Tanana Upland (Air Force 1995).

The Yukon-Tanana Upland is characterized by rounded even-topped ridges. In the western part, these rounded ridges trend northwestward to eastward and have altitudes of 1,500 to 3,000 feet. The ridges are surmounted by compact rugged mountains 4,000 to 5,000 feet in altitude. Ridges in the eastern part are 3,000 to 5,000 feet in altitude and rise 1,500 to 3,000 feet above adjacent valleys. Valleys in the western part are generally flat, alluvium floored, and 0.25-0.50 mile wide to within a few miles of headwaters. No glaciers are in the region, but the entire section is underlain by discontinuous permafrost (USGS 2000). The Yukon 5, Birch, Buffalo and Eielson MOAs also overlie the Tanana-Kuskokwim Lowland and the Northern Hills. The lowland is a broad depression north of the foothills of the Alaska Range. The Tanana and Delta rivers, rising in the Alaska Range, flow north across the lowland at intervals of 5 to 20 miles. Thaw lakes and sinks are abundant in the lowlands. The Northern Foothills of the Alaska Range are flat-topped east-trending ridges 2,000 to 4,500 feet in elevation, 3 to 7 miles wide, and

5 to 20 miles long, and separated by rolling lowlands 700 to 1,500 feet high and 2 to 10 miles wide (Air Force 1995).

The south central region, beneath the Susitna and Fox MOAs, is bounded on the east by the St. Elias and Chugach mountains, which are breached only by the Copper River Valley; the Aleutian Range rises along the western boundary of the region. Relief is extreme, with lowlands near sea level and mountains rising up to 10,000 to 20,320 feet. The northern portion of Susitna MOA overlies the Alaska Range from Ruth Glacier and Mount Barrille (7,650 feet) at the northeast edge almost to the Kichatna Mountains and Mount Dall (8,756 feet) in the west. This area is very rugged, with numerous peaks over 7,000 feet. The Fox MOAs overlie the central part of the Alaska Range in the north, the Clearwater Mountains in the center, the foothills of the Talkeetna Mountains in the southwest, and the Gulkana Upland and Copper River Lowland in the southeast. The central part of the Alaska Range contains ridges 6,000 to 9,000 feet high, surmounted by peaks over 9,500 feet in elevation, including Mount Deborah (12,329 feet), Mount Moffit (13,020 feet), and Mount Hayes (13,832 feet). The range rises abruptly from lower country on either side (Air Force 1995).

The western training airspaces (Galena, Stony, Naknek MOAs) overlie the Kuskokwim Mountains, the Tanana-Kuskokwim lowlands and the Holitna lowlands. The Tanana-Kuskokwim lowland is a broad depression bordering the Alaska Range on the north. Braided glacial streams rising in the Alaska Range flow northward across the lowland. Thaw lakes are present in areas of fine alluvium and the entire area consists of permafrost (USGS 2000). The Holitna lowland, ranging in elevation from 250 to 600 feet, occupies the southeastern portion of the upper Kuskokwim Basin and is bounded to the south by the Taylor Mountains-Nushagak Hills. At the western edge of the Holitna lowland, about halfway along its length, the Kuskokwim River cuts through the Kuskokwim Mountains in a gorge 100 to 400 feet deep, which lies within an older valley approximately 1,000 feet deep and 2 to 8 miles wide (Air Force 1995).

Water resources beneath the Yukon, Viper, Buffalo, Eielson, and Birch MOAs, in the interior region of Alaska, include a large system of streams and small rivers that feed into the Yukon River. Major drainage basins include the Porcupine River, Tanana River, and Upper and East Central Yukon basins (USGS 2000). Tributary to the Yukon River also are the Black and Little rivers below the Yukon 5 MOA, while the Fortymile, Ladue, Kandik, Nation, and Tatonduk rivers drain the area below the rest of the Yukon and Viper MOAs. Many of the terraces, broad alluvium-filled basins, and plateaus in the region are populated with thaw lakes. Oxbow lakes are common along the Yukon River (Air Force 1995).

Beneath the Fox and Susitna MOAs, in the South Central region of Alaska, water resources include the drainage basins associated with the Kichatna, Yenta, Kahiltna and Chulitna rivers. Beneath the Susitna MOA the rivers drain south out of the Alaska Range eventually discharging into Cook Inlet. Water resources beneath the Fox MOAs are split between the Tanana River drainage basin which flows north into the Yukon River and the Susitna drainage basin (Air Force 1995).

The western MOAs (Galena, Stony, and Naknek) are located across a broad portion of Alaska ranging from the Galena MOA just south of the Yukon River to the Naknek MOAs just north of Bristol Bay. Beneath the Galena MOA are the Sultatna, Susulanta, Nowitna, and Nixon Fork rivers, which all drain to the Yukon River. Beneath the Stony MOA is the Kuskokwim River, which flows through a wide, forested floodplain, which is interlaced with lakes, sloughs, and

oxbows and incised into the Tanana-Kuskokwim lowlands. The Kuskokwim River finally discharges to Kuskokwim Bay and the Bering Sea. The Mulchatna and Nushagak rivers drain the area beneath the Naknek MOAs discharging into Bristol Bay at Dillingham (Air Force 1995).

The offshore warning area W612 is presented on Figure 1.1-2. W612 is not scheduled for normal F-22A training. MTRs presented in Figure 2.2-4 are expected to be used by F-22A aircraft less than 40 percent of the time they are currently used by F-15E aircraft. Physical resources under these MTRs are comparable to those under nearby MOAs.

4.5.3 Environmental Consequences of Beddown

Beddown of two F-22A squadrons in place of one F-15C and one F-15E squadrons will not substantially change airspace use or training above the physical resources. The F-22A squadrons will spend more training time at higher altitudes than either the F-15C or F-15E squadrons. The F-22A would train with defensive countermeasures in existing airspace comparable to current F-15C and F-15E training. Training chaff and flares would be used in accordance with the operational procedures outlined in Section 2.2.3.

The only potential variation in physical effects is the difference in chaff used by F-22A and that used in F-15C and F-15E training. As described in Appendix A, all chaff consists of fine segments (thinner than a human hair) of aluminum-coated silica cut to lengths of 1/2 to 2 or more inches to reflect radar signals from threats to aircraft. The amount of chaff distributed within the airspace would amount to fewer than 0.015 grams (0.0005 ounces) per acre per year. Chaff rapidly breaks up to become indistinguishable from native soils. Chaff use or the increase of chaff use would not be able to be discerned in the environment and would not produce a significant effect upon water or soils under the airspace. The same number of plastic and nylon pieces would fall to the ground after flare deployment. With the F-22A chaff, each bundle of chaff has an additional three 2-inch by 4-inch pieces of mylar wrapping that drift to the ground. These pieces are similar to the plastic pieces that come from current chaff use. The mylar wrapping is similar to and thinner than the aluminum-coated mylar pieces that fall when flares are deployed. These materials are inert and are not expected to be concentrated in any way that could impact soil or water resources.

The number of flares proposed to be used in training is the same as the current flare usage. Flares are not projected to be a fire risk due to the altitude constraints placed on their use as described in Chapter 2.0. Flare debris consist of 1-inch by 1-inch plastic or nylon parts, aluminum-coated mylar wrapping materials, and a medium hailstone-sized plastic S&I device. These pieces are inert, do not pose a risk to humans or animals under the airspace (see Section 4.3.2).

Alaska Native Concerns

The local economy in many of the villages is dependent on natural resources. Based on past indications and scoping comments for this EA, Alaska Natives may be concerned if game in traditional hunting areas were affected. There are no anticipated physical effects that could impact natural resources or game under the airspace.

4.5.4 No Action

The No Action Alternative would not change use of the training airspace and expenditure of defensive countermeasures would not change from the current conditions. There would be no adverse effect to the earth and water resources beneath the airspace.

4.6 Biological Resources

4.6.1 Definition

Biological resources include vegetation and habitat, wetlands, fish and wildlife, and special-status species (on lands under SUA). Section 3.6.1 explains these resources in more detail. Table 4.6-1 identifies the relationship between special-status species and the Alaskan training airspace used by F-15C and F-15E pilots and proposed for use by F-22A pilots. The ROI for training airspace in Alaska includes all lands under the MOAs currently used by the F-15Cs and F-15Es at Elmendorf AFB.

4.6.2 Existing Conditions

Existing training airspace used by Elmendorf AFB occurs primarily in MOAs and ATCAAs, which overlie approximately 38.5 million acres. Depending on the MOA and overlying ATCAA, training may currently be authorized from 500 feet AGL to above 60,000 feet MSL. In some MOAs, supersonic flight is authorized above 5,000 feet AGL and occurs about 7.5 percent of the F-15C and F-15E training time. The F-15C and F-15E operate between 10,000 and 30,000 feet MSL two-thirds of the time (see Table 2.2-3). W-612 is not planned for substantial F-22A training and MTR training would be reduced to 40 percent of current use. For these reasons, the focus of this analysis is the SUA proposed for F-22A training.

Vegetation. The existing training airspace overlies the Upland Tundra and Boreal Forest ecoregions (Bailey 1995). Predominant land cover types are forests (60 percent), fields (17 percent), and tundra (15 percent) (Air Force 2001a). Forest types are largely evergreen and mixed conifer/deciduous. Over 8.1 million acres of special use areas occur under these MOAs. This includes National Wildlife Refuges under the Galena and Yukon 2, 4, and 5 MOAs and Denali National Park and Preserve under portions of the Susitna MOA, which are discussed in Section 4.8.2.

In Alaska, wetlands cover over 43 percent of the state's land, in contrast with the lower 48 states, where they occupy 5.2 percent. About 1,952,000 acres of aquatic habitats and wetlands occur under the existing training airspace (Air Force 2001a). Wetland types under the airspace are largely deciduous, evergreen, and mixed forest wetlands.

Fish and Wildlife. Common fish and wildlife species under the existing airspace are similar to that described in Section 3.6.2. Regionally important game species include moose, caribou (*Rangifer tarandus*), Dall's sheep (*Ovis dalli*), bears, and various species of waterfowl. Moose, caribou, and Dall's sheep have critical lambing/calving, wintering, and rutting areas underneath the training airspace. The Air Force has existing airspace restrictions that prevent potential overflight effects on these and other wildlife species (Air Force 1995).

Special-Status Species. Special-status species include species designated as threatened, endangered, or candidate species by state or federal agencies. There are no federally listed threatened or endangered species that occur under lands of the existing training airspace (Table 4.6-1). Five Alaska species of special concern likely occur in the ROI. These are peregrine falcon, olive-sided flycatcher, gray-cheeked thrush, blackpoll warbler, and Townsend's warbler. Habitat requirements of these species are discussed in Section 3.6.2.

Table 4.6-1. The Relationship of Special-Status Species to Training Airspace

Common Name	*Scientific Name*	*Status*	*Occurrence under Training Airspace*
Aleutian shield fern	*Polystichum aleuticum*	FE	No
Chinook salmon (Fall stock from Snake River)	*Oncorhynchus tshawytscha*	AK SSC	No
Leatherback sea turtle	*Dermochelys coriacea*	FE	No
Short-tailed albatross	*Phoebastria albatrus*	FE, AKE	No
Kittlitz's murrelet	*Brachyramphus brevirostris*	FC	No
Eskimo curlew	*Numenius borealis*	FE, AKE	Unlikely; species is considered extinct
Spectacled eider	*Somateria fisheri*	FT, AK SSC	No
Stellar's eider (AK breeding population)	*Polysticta stelleri*	FT, AK SSC	No
Aleutian Canada goose	*Branta canadensis leucopareia*	AK SSC	No
Peregrine falcon	*Falco peregrinus*	AK SSC	Yes
Northern goshawk (southeast AK population)	*Accipiter gentilis laingi*	AK SSC	No
Olive-sided flycatcher	*Contopus cooperi*	AK SSC	Yes
Gray-cheeked thrush	*Catharus minimus*	AK SSC	Yes
Townsend's warbler	*Dendroica townsendi*	AK SSC	Yes
Blackpoll warbler	*Dendroica striata*	AK SSC	Yes
Brown bear (Kenai Peninsula population)	*Ursus arctos horribilis*	AK SSC	No
Sea otter (southwest Alaska distinct population segment)	*Enhydra lutris kenyoni*	FT, AK SSC	No
Harbor seal	*Phoca vitulina*	AK SSC	No
Stellar sea-lion	*Eumetopias jubatus*	FT=eastern population, FE=western population AK SSC	No
Bowhead whale	*Balaena mysticetus*	FE, AK SSC	No
Finback whale	*Balaenoptera physalus*	FE	No
Humpback whale	*Megaptera novaeangliae*	FE, AKE	No
Right whale	*Eubalaena glacialis*	AKE	No
Blue whale	*Balaenoptera musculus*	AKE	No
Beluga whale (Cook Inlet population)	*Delphinapterus leucas*	AK SSC	No

FE = Federal Endangered; FT = Federal Threatened; FC = Federal Candidate; AKE = State of Alaska Endangered; AK SSC = State of Alaska Species of Special Concern.

Sources: Alaska Department of Fish and Game 2005a and 2005b, United States Fish and Wildlife Service (USFWS) 2005.

4.6.3 Environmental Consequences of Beddown

There will be no construction or ground-disturbing consequences associated with the training airspace for the Proposed Action. Therefore, no impacts would occur to vegetation and no wildlife habitat would be lost under the training airspace.

No changes to the existing training airspace would occur under the Proposed Action. The higher flight characteristics and mission requirements of the F-22As would result in somewhat different use of the airspace when compared to the current F-15Cs and F-15Es. The F-22As are expected to generally fly at higher altitudes, with less than 5 percent occurring below 5,000 AGL and 30 percent above 30,000 AGL. This reduction in use at the lower elevations would result in lower overall noise levels from subsonic aircraft noise. The F-22As would fly at supersonic speed approximately 25 percent of the time or three times as often as the F-15Cs and F-15-Es. F-22A supersonic flight would typically occur at higher altitudes. The sonic booms generated at higher altitudes will produce less overpressure on the ground. F-22A training would result in an increased number of sonic booms per month under specific MOAs. Section 4.2.3 provides details on aircraft noise associated with the proposed F-22A training beddown. F-22A training on MTRs would be projected to be one-half the current F-15E MTR training.

During scoping, the public expressed specific concern for noise impacts on those species that are hunted in Alaska. Moose, caribou, and Dall's sheep are important game species in Alaska, and critical calving grounds are located under the training airspace. Several studies have documented the reaction and effects to ungulates exposed to military aircraft overflights. Responses reported ranged from no reaction and habituation to panic reactions followed by stampeding (Weisenberger *et al.* 1996; see reviews in Manci *et al.* 1988). Although few studies have evaluated the effect of military overflights on moose, several have studied the effect on caribou. A recent study in Alaska documented only mild short-term reactions of caribou to military overflights in the Yukon MOAs (Lawler *et al.* 2005). A large portion of the Fortymile Caribou Herd calves underneath the Yukon MOAs. Lawler *et al.* (2005) concluded that military overflights did not cause any calf deaths, nor did cow-calf pairs exhibit increased movement in response to the overflights. In contrast, Maier *et al.* (1988) found that cow-calf pairs of the Delta Caribou Herd in interior Alaska that were exposed to low-altitude overflights moved about 2.5 km more per day than those not exposed (Maier *et al.* 1998). The authors, however, stated that this distance was of low energetic cost. Harrington and Veitch (1991) expressed concern for survival and health of woodland caribou calves in Labrador, Eastern Canada, where military training flights occur over 100 feet AGL. Over 98 percent of F-22A training flights would be above 2,000 feet (see Section 2.2)

Beckstead (2004) reported on a study of the effects of military jet overflights on Dall's sheep under the Yukon 1 and 2 MOAs in Alaska. The study could find no difference in population trends, productivity, survival rates, behavior, or habitat use between areas mitigated and not mitigated for low-level military aircraft by the Alaska MOAs Environmental Impact Statement (EIS) (Air Force 1995). In the mitigated area, flights are restricted to above 5,000 feet AGL during the lambing season, while the unmitigated area could experience flights as low as 100 feet AGL. The F-22A does not fly below 500 feet and is above 5,000 feet 95 percent of the training time.

These and studies on noise effects to other wildlife species are reviewed in Appendix E. Based on previous research, current flight restrictions over calving/lambing grounds (Air Force 1995), and the relatively unchanged noise levels associated with the proposed F-22A training, noise

associated with the F-22A beddown at Elmendorf AFB would have similar impacts on wildlife as exist under baseline conditions. Some animals may startle in response to a sonic boom. However, most animals under the training airspace have been previously exposed to sonic booms from F-15Cs, F-15Es, and other training aircraft and are likely habituated to the sound (see Appendix E).

Use of training chaff and flares is expected to continue with the F-22A replacing some F-15C and F-15E aircraft training in the airspace. Chaff and flare use is projected to remain the same as under current conditions. F-22A chaff has three additional pieces (mylar) that fall to the ground. There would be no change in the minimum altitude or seasonal restrictions on flare release. The potential environmental consequences and characteristics of chaff and flares are reviewed in Appendices A and B. Specific issues reviewed are the potential for and consequences of (1) ingestion of chaff fibers or chaff or flare plastic, nylon, or mylar materials; (2) inhalation of chaff fibers; (3) physical external effects from chaff fibers, such as skin irritation; (4) effects on water quality and forage quality; (5) increased fire potential; and (6) potential for being struck by medium hailstone-sized flare debris. This review demonstrates that no reports or studies to date have documented negative impacts of training chaff or flares to biological resources. Chaff and flares are regularly used in approved Alaskan SUA. Therefore, no impacts to biological resources would be expected with the continued use of training chaff and defensive flares in the Alaska training airspace.

Alaska Native Concerns

The local economy in many of the villages is dependent on the resources of terrestrial communities described above. Alaska Natives expressed concerns during scoping that existing and projected noise levels and sonic booms could affect game species in traditional hunting areas. As described above, terrestrial resources under the Alaskan SUA that are used by a number of Alaska Native villages in traditional subsistence activities are not expected to be adversely affected by the change from F-15C and F-15E training to F-15C and F-22A training.

4.6.4 No Action

Under the No Action Alternative, two squadrons of F-22A would not beddown at Elmendorf AFB. Airspace training would remain the same as under current conditions. F-15C and F-15E aircraft would continue to train in the airspace at supersonic speeds and use chaff and defensive flares. Biological resources would not change from existing conditions.

4.7 Cultural Resources

4.7.1 Definition

Cultural resources are any prehistoric or historic district, site, building, structure, or object considered important to a culture or community for scientific, traditional, religious or other purposes. For more information on the definition of cultural resources as they apply to the base and environs, see Section 3.7. Section 3.7.2 presents treatment of the local and regional historical setting.

The ROI for cultural resources is the area within which the Proposed Action has the potential to affect existing cultural resources. For the Proposed Action, the ROI is defined as the lands beneath training airspace used by the Elmendorf-based F-15C and F-15E aircraft.

4.7.2 Existing Conditions

Archaeological sites under training airspace include native burial grounds, village and settlement sites, and historic mining sites (Air Force 1991a). Architectural resources under the proposed MOAs include structures relating to gold mining, trapping, or the railroad (Air Force 1991). In addition to National Register of Historic Places (NRHP)-listed sites, there are likely to be additional cultural resources that are either eligible or potentially eligible for NRHP listing under airspace.

Galena MOA

There are no NRHP-listed cultural sites under the Galena MOA. However, connecting trails of the Iditarod National Historic Trail are located under the MOA. The Iditarod Trail is a network of more than 2,300 trails which takes its name from an Athabascan Indian village. Trails used by the Ingalik and Tanaina Indians and Russian fur traders were improved by miners in the early 1900s. The trails were heavily used by miners until 1924 when airplanes came into use (Bureau of Land Management [BLM] 2000). In 1925, dog teams and drivers gained national attention when they delivered diptheria serum from Nenana to Nome in 127 hours along the trail. The annual Iditarod race retraces the route.

Stony A/B MOA

The Stony A and B MOAs lie above the Kolicachuk, Upper Kuskokwim and Deg Hit'An language regions (Alaska Native Knowledge Network 2000). There are two NRHP-listed resources under the Stony A,B MOAs. The Kolmakov Redoubt Site is in the Sleetmute area under Stony B. Sts. Constantine and Helen Chapel is in Lime Village under Stony A (National Register Information Service [NRIS] 2000).

Federally recognized Alaska Native villages under or near the airspace are: Crooked Creek, Georgetown, Lime Village, Red Devil, Sleetmute, and Stony River (Bureau of Indian Affairs 2000). The Regional Native Corporation for the area is Calista.

Crooked Creek was reported by a Russian explorer in 1844 as "Kvikchapak" in Yup'ik and "Khottylno" in Ingalik (Alaska Department of Community and Economic Development [DCED] 2000). At that time the site was used as a summer fish camp for the Kwigiumpainukamuit villagers. A permanent settlement was established there in 1909 as a way-station for the Flat and Iditarod gold camps. A trading post was founded in the upper village (upriver from the creek mouth) in 1914, and a post office and school were built in the late 1920s. The lower village was settled by Eskimo and Ingalik people. Native lifestyle is based on subsistence activities including salmon, moose, caribou, and waterfowl (Alaska DCED 2000). Both parts of the village remain today.

Georgetown is on the north bank of the upper Kuskokwim River in the Kilbuck-Kuskokwim Mountains. Europeans first entered the middle Kuskokwim area in 1844 when the Russian explorer Zagoskin sailed upriver to McGrath. At that time, Georgetown was a summer fish camp for residents of Kwigiumpainukamuit and was known as Keledzhichagat (Alaska DCED 2000). Gold was found along the George River in 1909 and the mining settlement of Georgetown was named for three traders. The town grew to about 200 cabins and several stores. By 1953, only one large structure from the mining era remained: a two-story cabin that belonged to George Fredericks. The present settlement developed in the 1950s. A state school was established in 1965 and remained until 1970. Georgetown is presently used as a seasonal fishing camp. It has no year-round residents (Alaska DCED 2000).

Lime Village is on the south bank of the Stony River south of McGrath. It is a Dena'ina Athabascan Indian settlement that was settled by Europeans in 1907. Residents of nearby Lake Clark used the location as a summer fishing camp (Alaska DCED 2000). The 1939 U.S. Census called the settlement Hungry Village. Sts. Constantine and Helen, a Russian Orthodox chapel was built there in 1960 and a state school constructed in 1974 (Alaska DCED 2000). Presently, subsistence is based on hunting and gathering with some seasonal work in fire fighting and trapping.

Red Devil is located on both banks of the Kuskokwim River at the mouth of Red Devil Creek. The village was named after the Red Devil mercury mine established in 1921. The mine continued to operate until 1971 (Alaska DCED 2000). The village is a mix of Eskimo, Athabascan, and non-native inhabitants who supplement their income with subsistence activities.

Sleetmute is on the east bank of the Kuskokwim River. It is an Ingalik Indian village that has also been known as Sikkiut, Steelmut, and Steitmute (Alaska DCED 2000). A Russian trading post was built at the nearby Holitna River junction 1.5 miles away, but was moved farther downriver in 1841. Another trading post was started at Sleetmute in 1906. A school and post office opened in the 1920s and a Russian Orthodox church was built in 1931 (Alaska DCED 2000).

Stony River, also known as Moose Village and Moose Creek, is on the north bank of the Kuskokwim River near its junction with the Stony River. It began as a trading post and riverboat landing supplying mining operations to the north (Alaska DCED 2000). The first trading post and post office were opened during the 1930s, and area natives established residency there in the 1960s. The village is a mix of Athabascan and Eskimo people who depend heavily on a subsistence economy.

Susitna MOA

No NRHP-listed cultural resources are under this MOA (NRIS 2000). No federally recognized Alaska Native villages are located under Susitna airspace (Bureau of Indian Affairs 2000).

Naknek 1/2 MOAs

There are no NRHP-listed resources under the Naknek MOAs (NRIS 2000). One federally recognized Alaska Native village, Koliganek, lies under the edge of Naknek 1 airspace (Bureau of Indian Affairs 2000).

Koliganek is on the Nushagak River north of Dillingham. First contact with Europeans occurred in the early 19th century when Russian fur traders entered the area. Prior to its present location, the village was on Tikchik Lake near the headwaters of the Nuyakuk River (Bristol Bay Native Association 2000). Archaeological excavations indicate the site was occupied from about 1820 until the turn of the 19th century by people who practiced a coastal Bering Sea Eskimo lifeway, hunting sea mammals, fishing, and trapping on land (Bristol Bay Native Association 2000). After a flu epidemic, residents moved to the confluence of the Nuyakuk and Nushagak Rivers (Old Koliganek). A Russian Orthodox church, St. Yako, was established in the village in 1870. The residents moved to another site in 1938 (Middle Koliganek) because of a decreasing supply of firewood near the village. The present site was established in 1964. Residents depend on the Bristol Bay commercial salmon fishery and fur trapping. The Koliganek Traditional Council is the governing body for the Native residents of Koliganek (Bristol Bay Native Association 2000). The Regional Native Corporation is the Bristol Bay Native Corporation.

Fox MOAs

Although there are no Alaska Native Villages within this area, there are scattered remote residences and BLM-managed recreation areas. The area is frequently used for subsistence and recreational hunting (BLM 2006). Additionally, the NRHP-listed Tangle Lakes Archaeological district is located on lands underlying the Fox MOA. The district contains more than 400 recorded archaeological sites spanning 10,000 years of human presence in the region (BLM 2006).

Birch, Buffalo, Eielson, and Viper MOAs

No NRHP-listed cultural resources underlie these MOAs (NRIS 2006) The Regional Native Corporation for the area is Doyon; however, no federally recognized Alaska Native villages are located under these MOAs.

Yukon MOAs

The Yukon MOAs overlie a large area to the north and east of Fairbanks. They are with Doyon Regional Native Corporation. Several native villages occur in this area, as well as NRHP resources.

The small village of Healy Lake, 29 miles east of Delta Junction, is under the Yukon 1 MOA. Healy Lake is home to the federally recognized Healy Lake Village Council. Predominant activity in the area is the recreational use of Healy Lake during summer months.

The village of Circle underlies Yukon 2 MOA, on the south bank of the Yukon River at the edge of the Yukon Flats National Wildlife Refuge, about 160 miles northeast of Fairbanks. The federally recognized Circle Native Community is predominantly Athabaskan. Circle, or Circle City, was established in 1893 as a supply point for goods shipped up the Yukon River and then to the gold mining camps. By 1896, Circle was the largest mining town on the Yukon, with a population of 700. Residents, some of whom are part-time, now number approximately 100. The Coal Creek Historic Mining District is on the NRHP.

The federally recognized Alaska Native Village of Eagle underlies Yukon 3 MOA, six miles west of the Alaska Canadian border. It is located on the Taylor Highway, on the left bank of the Yukon River at the mouth of Mission Creek. The area has been the historical home to Han Kutchin Indians, and was once known by non-Native Alaskans as "Johnny's," after a leader named John. The adjacent community of Eagle saw its beginnings around 1874 as a log house trading station. Named "Belle Isle", the station continued to provide supplies and trade goods for prospectors who worked the upper Yukon and its tributaries until Eagle City was founded at the site in 1897. Fort Egbert was established adjacent to Eagle in 1899; a major accomplishment was construction of part of the Washington-Alaska Military Cable and Telegraph System in 1903. Eagle was incorporated in 1901, becoming the first incorporated city in the Interior. Several NRHP properties occur in or near Eagle, including the Eagle Historic District, Woodchopper Roadhouse, the Frank Slaven Roadhouse, the Steele Creek Roadhouse, the George McGregor Cabin and the Ed Beiderman Fish Camp (NRIS 2006). Eagle is listed in the NRIS as the location of the Chicken Historic District, but it is 66 miles south of Eagle on the Taylor Highway.

The Alaska Native Village Chalkyitsik underlies Yukon 5 MOA. Archaeological excavations indicate this region may have been first used as early as 12,000 years ago. This village on the Black River has traditionally been an important seasonal fishing site for the Gwich'in. Village

elders remember a highly nomadic way of life where from autumn into the spring they lived at the headwaters of the Black River, and fished downriver in the summer. Contact with early explorers was limited, and the Black River Gwich'in receive scant mention in early records. The location of the village at its present site is due in part to low water in the Black River in the 1930s. A boat carrying materials intended for a school to be built in Salmon Village had to be unloaded at the Chalkyitsik seasonal fishing camp that then consisted of four cabins. Rather than reload the construction materials, the school was built at Chalkyitsik, and the Black River people began to settle around the school.

4.7.3 Environmental Consequences of Beddown

Beddown of F-22A aircraft at Elmendorf AFB would replace some F-15C and F-15E aircraft that currently train in the airspace with F-22A aircraft. A summary of federal regulations and guidelines established for the management of cultural resources is presented in Section 3.7.

No impacts to historic properties under the airspace are expected as a result of the proposed F-22A beddown. Chaff and flare use are not expected to impact historic properties under the airspace. The F-22A would conduct similar missions and training programs to those conducted by F-15C and F-15E aircraft currently located at Elmendorf AFB. The increase in mylar pieces associated with F-22A chaff is not projected to impact historic properties. All F-22A activities would take place in the same airspace currently used by the base. There would be less air-to-ground munitions use on approved Army ranges with the F-22A as compared to the F-15E.

Traditional Cultural Properties and Alaska Native Concerns

A number of Alaska Native villages and traditional subsistence areas underlie Alaskan SUA (see Figure 4.7-1). The figure also includes the boundaries of the private Native Alaska regional corporations. This EA analysis considers the Alaska Native villages and their local economies based primarily on subsistence hunting and resource extraction for marketable products. During scoping comments, Alaska Natives expressed concern that existing and projected noise levels and sonic booms could affect game in traditional hunting areas and potentially impact the local economy dependent on these resources. During meetings held at Lime Village and Sleetmute under the Stony MOA for the Initial F-22 Beddown (Air Force 2001), Alaska Natives involved with subsistence hunting did not see noise as impacting game species (Air Force 2001a). Refer to Appendix E for a review of the potential effects of aircraft noise on biological resources. No traditional cultural properties have been specifically identified underneath the airspace. However, this does not mean that none are present.

The annual average noise levels under the MOAs are not expected to noticeably change as a result of F-22A training. The typical higher altitudes for F-22A training are likely to reduce average noise levels. The number of supersonic events is expected to increase as a result of the increased flight time of the F-22A above supersonic speeds. As noted in Section 4.2.3, these additional booms could disturb or increase annoyance among residents or users of resources under the Stony MOAs. This change would likely be discernible to Alaska Natives or others residing under or using the land under the airspace for an extended period of time. As noted in Section 4.6.3, game and other subsistence species have previously experienced sonic booms and are likely habituated to them. For any damage claims associated with sonic booms, the Air Force has established procedures that begin with contacting the Elmendorf AFB Public Affairs Office. The increased number of sonic booms as a result of training is not expected to significantly affect cultural resources or Alaska Native activities.

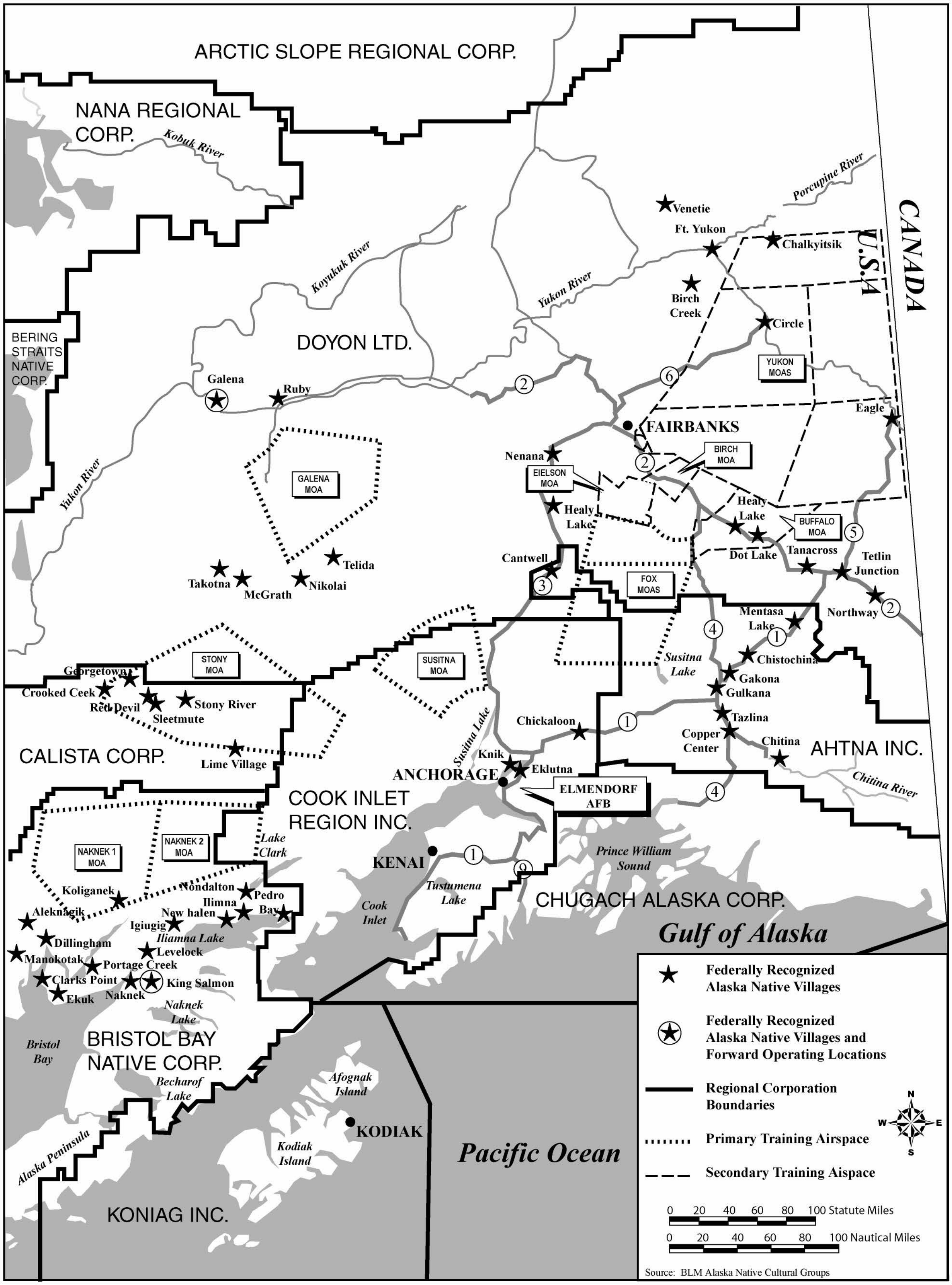


Figure 4.7-1. Alaska Native Villages in the Airspace Environment

Air Force airspace managers currently identify and mitigate where possible use of specific airspaces during hunting seasons to avoid significant impacts to Alaska Native resources. This practice would continue for the proposed F-22A beddown. No significant impacts to traditional cultural properties or Alaska Native activities are anticipated to result from the proposed beddown.

4.7.4 No Action

Under the No Action Alternative, the F-22A would not beddown at Elmendorf AFB. Existing military flight training would continue under this alternative and resources would continue to be managed in compliance with federal law and Air Force regulation.

4.8 Land Use and Recreation

4.8.1 Definition

Land use addresses general land use patterns, land ownership, land management plans, and special use areas under the SUA. General land use patterns characterize the types of uses within a particular area such as forests, residential, military, and recreational. Land ownership is a categorization of land according to type of owner. The major land ownership categories include state, federal, Alaska Native corporations, and other private landowners. Federal lands are described by the managing agency, which may include the USFWS, the U.S. Forest Service, BLM, or DoD. State of Alaska land under the study area is typically managed by the Departments of Fish and Game or Natural Resources. The land management plans include those documents prepared by agencies to establish appropriate goals for future use and development. As part of this process, sensitive land use areas are often identified by agencies as being worthy of more rigorous management. As noted in Section 4.1.1, FAA administers all navigable airspace above public and private lands.

Recreation resources consider outdoor recreational activities that take place away from the residences of participants. This includes natural resources and man-made facilities that are designated or available for public recreational use in remote areas. As part of the mitigations identified for the MOA EIS ROD, the Air Force participates in the Resource Protection Council to work with agencies, Alaska Natives, and others in the identification and mitigation of potential consequences to environmental resources (Air Force 1995).

The ROI for land use and recreation consists of all the lands under the existing training airspace used for Elmendorf F-15C and F-15E training.

4.8.2 Existing Conditions

The general land use patterns underlying this airspace may be characterized as very rural. There are large public land areas as well as some agricultural forested areas. There are also a number of small towns and villages throughout the area that occur along roads and highways, as well as in remote areas accessible only by waterways or small planes. Within populated areas, a variety of land use types occur, including residential, commercial, industrial, and public lands.

Special use areas provide recreational activities (trails and parks), hunting, fishing, and/or solitude or wilderness experience (parks, forests, and wilderness areas). Table 4.8-1 identifies special use areas under the airspace units. Figures 4.8-1 and 4.8-2 present these special use areas under or near training airspace. For the purpose of this EA, Alaska Native regional corporation private lands and village statistical areas are included with recreational areas. This broad grouping of special use areas includes large public land areas such as state or national parks, forests, and reserves which may include individual campgrounds, trails, and visitor centers. This broad definition of special use areas also includes large private land areas under the airspace.

Galena and Susitna MOAs

Special use areas of note underlying the Alaskan airspace include designated wildlife areas, trails, and parks. The Nowitna National Wildlife Refuge under the Galena MOA is managed by the USFWS. This refuge encompasses forested lowlands, hills, lakes, marshes, ponds, and streams and the nationally designated Nowitna River. The refuge was established to protect waterfowl and their habitat. Hunting, fishing, and river floating are recreational activities within the refuge.

Segments of the Iditarod National Historic Trail underlie the Galena and Susitna MOAs (Air Force 1995). The Iditarod Trail is a network of more than 2,300 trails that takes its name from an Athabascan Indian village.

A portion of Denali State Park, about 550,000 acres of Denali National Park, and about 400,000 acres of Denali National Preserve also underlie the northern portion of the Susitna MOA. Denali National Park, managed by the National Park Service, was established in 1917 as Mount McKinley National Park. In 1980, the Alaska National Interest Lands Conservation Act expanded the boundary by 4 million acres and re-named it Denali National Park and Preserve. Denali is currently 6 million acres in size. There are three distinct units that make up Denali National Park and Preserve: Denali Wilderness, Denali National Preserve, and Denali National Park. The Susitna MOA does not overlie the Denali Wilderness.

Fox and Stony MOAs

Lands underlying the Fox MOA include the Tangle Lakes, Tangle River, Delta River, Gulkana River, components of the National Wild and Scenic River System, Tangle Lakes Archaeological District, and Nelchina Public Use Area. Although there are no communities within this area, there are scattered remote residences. The Fox MOA overlies areas frequently used for recreational hunting, including BLM-managed recreation areas.

Stony A and B MOAs overlie a number of small communities including Georgetown, Crooked Creek, Red Devil, Sleetmute, and Stony River (see Section 4.7.2).

Yukon and Viper MOAs

The Yukon MOAs overlie remote residences or parcels along the Salcha River, as well as the communities of Circle, Central, Circle Hot Springs, Chena Hot Springs, Eagle, Chicken, Eagle Village, Boundary, and Chalkyitsik. Some of the special use areas within this area include the Yukon-Charley Rivers National Preserve, Charley National Wild River, and Fortymile National Wild, Scenic, and Recreational River. Notices along these rivers, such as the Birch Creek Wild and Scenic River, explain the SUA and the use of the airspace to recreationists.

Table 4.8-1. Special Use Areas within F-22A Airspace (Page 1 of 3)

Airspace	*Special Use Area*	*Designation*	*Total Area of Airspace (acres)*	*Total Area of Special Use Area (acres)*	*Special Use Area Within Airspace (acres)*	*% of Special Use Area Within Airspace*	*% of Airspace Which is Special Use Area*
Birch MOA	Birch Lake State Recreation Site	State Recreation Area	359,488	204	204	100.00	0.06
Birch MOA	Doyon	Alaska Native Regional Corp.	359,488	127,831,010	359,488	0.28	100.00
Buffalo MOA	Doyon	Alaska Native Regional Corp.	1,398,549	127,831,010	1,289,746	1.01	92.22
Buffalo MOA	Healy Lake	Alaska Native Village Statistical Area	1,398,549	109,933	108,803	98.97	7.78
Eielson MOA	Doyon	Alaska Native Regional Corp.	611,159	127,831,010	611,159	0.48	100.00
Fox 1 MOA	Doyon	Alaska Native Regional Corp.	968,360	127,831,010	968,360	0.76	100.00
Fox 2 MOA	Doyon	Alaska Native Regional Corp.	79,544	127,831,010	79,544	0.06	100.00
Fox 3 MOA	Ahtna	Alaska Native Regional Corp.	3,142,055	18,407,946	861,045	4.68	27.40
Fox 3 MOA	Cook Inlet	Alaska Native Regional Corp.	3,142,055	21,308,085	896,648	4.21	28.54
Fox 3 MOA	Doyon	Alaska Native Regional Corp.	3,142,055	127,831,010	1,384,361	1.08	44.06
Fox 3 MOA	Gulkana Wild & Scenic River	Wild and Scenic River	3,142,055	105,257	5,414	5.14	0.17
Galena MOA	Doyon	Alaska Native Regional Corp.	3,314,834	127,831,010	3,314,836	2.59	100.00
Galena MOA	Nowitna National Wildlife Refuge	National Wildlife Refuge	3,314,834	2,019,411	612,935	30.35	18.49
Naknek 1 MOA	Bristol Bay	Alaska Native Regional Corp.	3,294,225	26,195,347	3,251,606	12.41	98.71
Naknek 1 MOA	Koliganek	Alaska Native Village Statistical Area	3,294,225	62,162	44,179	71.07	1.34
Naknek 1 MOA	Wood-Tilchik State Park	State Park	3,294,225	515,427	395,979	76.83	12.02
Naknek 2 MOA	Bristol Bay	Alaska Native Regional Corp.	2,339,458	26,195,347	1,832,356	6.99	78.32
Naknek 2 MOA	Cook Inlet	Alaska Native Regional Corp.	2,339,458	21,308,085	505,018	2.37	21.59
Stony A MOA	Calista	Alaska Native Regional Corp.	3,430,001	33,099,981	1,939,436	5.86	56.54
Stony A MOA	Cook Inlet	Alaska Native Regional Corp.	3,430,001	21,308,085	552,642	2.59	16.11
Stony A MOA	Doyon	Alaska Native Regional Corp.	3,430,001	127,831,010	908,096	0.71	26.48
Stony A MOA	Lime Village	Alaska Native Village Statistical Area	3,430,001	34,186	33,007	96.55	0.96

Table 4.8-1. Special Use Areas within F-22A Airspace (Page 2 of 3)

Airspace	*Special Use Area*	*Designation*	*Total Area of Airspace (acres)*	*Total Area of Special Use Area (acres)*	*Special Use Area Within Airspace (acres)*	*% of Special Use Area Within Airspace*	*% of Airspace Which is Special Use Area*
Stony A MOA	Stony River	Alaska Native Village Statistical Area	3,430,001	13,018	3,019	23.19	0.09
Stony B MOA	Calista	Alaska Native Regional Corp.	2,016,837	33,099,981	1,441,097	4.35	71.45
Stony B MOA	Crooked Creek	Alaska Native Village Statistical Area	2,016,837	27,906	15,159	54.32	0.75
Stony B MOA	Doyon	Alaska Native Regional Corp.	2,016,837	127,831,010	499,096	0.39	24.75
Stony B MOA	Georgetown	Alaska Native Village Statistical Area	2,016,837	16,659	16,659	100.00	0.83
Stony B MOA	Red Devil	Alaska Native Village Statistical Area	2,016,837	16,275	16,275	100.00	0.81
Stony B MOA	Sleetmute	Alaska Native Village Statistical Area	2,016,837	18,945	18,945	100.00	0.94
Stony B MOA	Stony River	Alaska Native Village Statistical Area	2,016,837	13,018	9,999	76.81	0.50
Susitna MOA	Cook Inlet	Alaska Native Regional Corp.	2,098,465	21,308,085	1,716,651	8.06	81.81
Susitna MOA	Denali National Park & Preserve	National Park National Preserve	2,098,465	6,029,385	553,989 391,748	9.19 6.5	26.4 18.67
Susitna MOA	Denali State Park	State Park	2,098,465	324,242	50,985	15.72	2.43
Susitna MOA	Doyon	Alaska Native Regional Corp.	2,098,465	127,831,010	381,175	0.30	18.16
Yukon 1 MOA	Chena River State Rec Area	State Recreation Area	3,198,318	303,481.281	256,708.4 82	84.59	8.03
Yukon 1 MOA	Doyon	Alaska Native Regional Corp.	3,198,318	127,831,010	3,198,318	2.50	100.00
Yukon 1 MOA	Fortymile Wild & Scenic River	Wild and Scenic River	3,198,318	226,745	673	0.30	0.02
Yukon 1 MOA	Healy Lake	Alaska Native Village Statistical Area	3,198,318	109,933	1	0.00	0.00
Yukon 1 MOA	Yukon-Charley Rivers National Preserve	National Preserve	3,198,318	2,521,315	499,384	19.81	15.61
Yukon 2 MOA	Birch Creek Wild & Scenic River	Wild and Scenic River	4,180,238	68,867	68,867	100.00	1.65
Yukon 2 MOA Restricted Area 2205	Chena River State Rec Area	State Recreation Area	4,180,238	303481.281	46087.982	15.19	1.10
Yukon 2 MOA	Circle	Alaska Native Village Statistical Area	4,180,238	3,643	3,643	100.00	0.09
Yukon 2 MOA	Doyon	Alaska Native Regional Corp.	4,180,238	127,831,010	4,176,595	3.27	99.91

Table 4.8-1. Special Use Areas within F-22A Airspace (Page 3 of 3)

Airspace	*Special Use Area*	*Designation*	*Total Area of Airspace (acres)*	*Total Area of Special Use Area (acres)*	*Special Use Area Within Airspace (acres)*	*% of Special Use Area Within Airspace*	*% of Airspace Which is Special Use Area*
Yukon 2 MOA	Steese National Conservation Area	National Conservation Area	4,180,238	1,154,018	785,042	68.03	18.78
Yukon 2 MOA	Yukon Flats National Wildlife Refuge	National Wildlife Refuge	4,180,238	11,172,807	654,752	5.86	15.66
Yukon 2 MOA	Yukon-Charley Rivers National Preserve	National Preserve	4,180,238	2,521,315	592,117	23.48	14.16
Yukon 3 MOA	Doyon	Alaska Native Regional Corp.	3,207,858	127,831,010	3,194,193	2.50	99.57
Yukon 3 MOA	Eagle	Alaska Native Village Statistical Area	3,207,858	23,353	13,665	58.52	0.43
Yukon 3 MOA	Fortymile Wild & Scenic River	Wild and Scenic River	3,207,858	247,049	223,607	90.51	6.97
Yukon 3 MOA	Yukon-Charley Rivers National Preserve	National Preserve	3,207,858	2,521,315	375,752	14.90	11.71
Yukon 4 MOA	Doyon	Alaska Native Regional Corp.	2,846,455	127,831,010	2,846,455	2.23	100.00
Yukon 4 MOA	Yukon Flats National Wildlife Refuge	National Wildlife Refuge	2,846,455	11,172,807	149,644	1.34	5.26
Yukon 4 MOA	Yukon-Charley Rivers National Preserve	National Preserve	2,846,455	2,521,315	998,833	39.62	35.09
Yukon 5 MOA	Chalkyitsik	Alaska Native Village Statistical Area	2,285,414	1,546	1,546	100.00	0.07
Yukon 5 MOA	Doyon	Alaska Native Regional Corp.	2,285,414	127,831,010	2,283,868	1.79	99.93
Yukon 5 MOA	Yukon Flats National Wildlife Refuge	National Wildlife Refuge	2,285,414	11,172,807	1,469,990	13.16	64.32
Viper MOA	Doyon	Alaska Native Regional Corp.	68,181	127,831,010	68,181	0.05	100.00

MOA = Military Operations Area
Source: National Geospatial-Intelligence Agency 2005

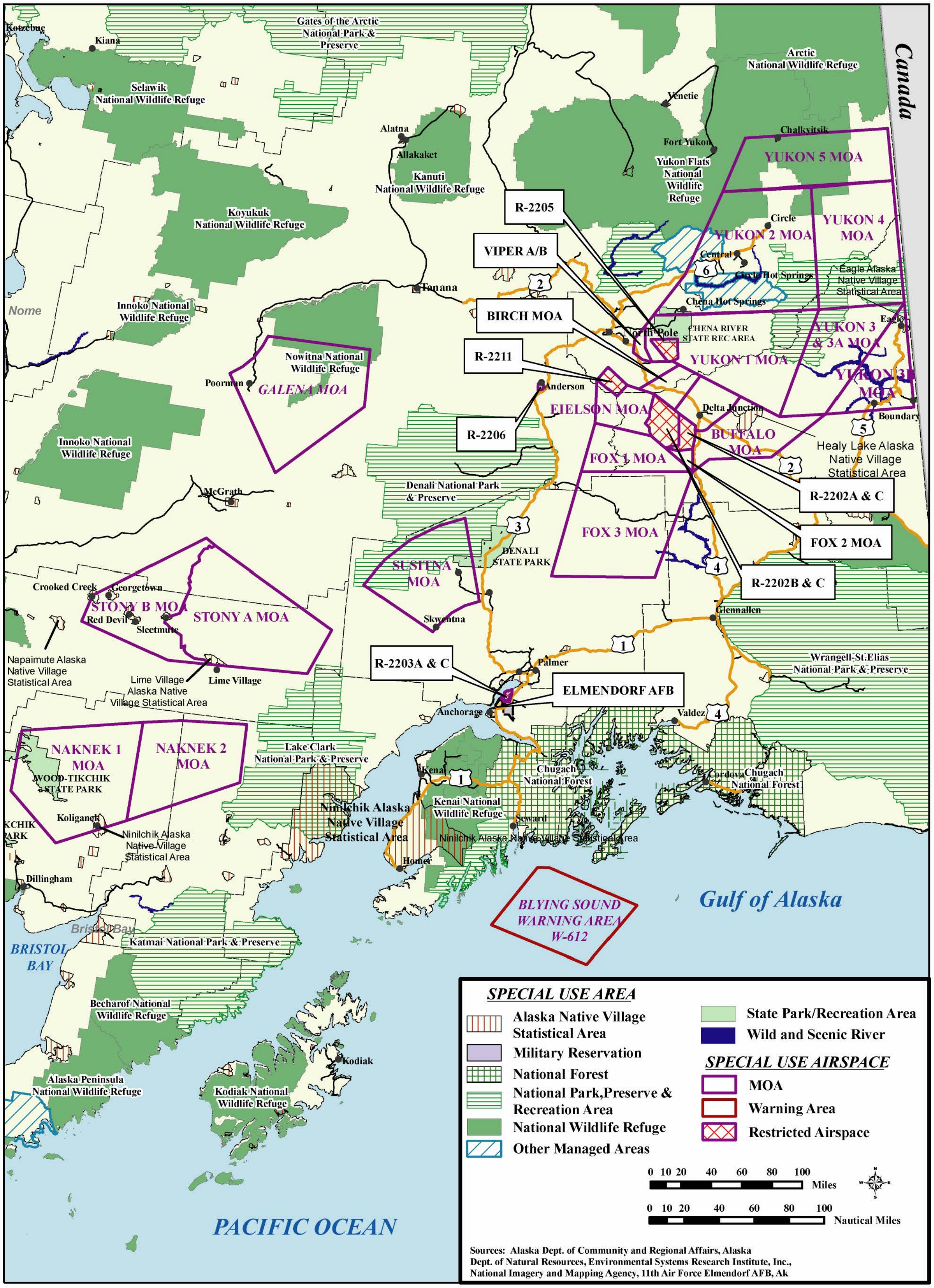


Figure 4.8-1. Special Use Areas Underlying Special Use Airspace

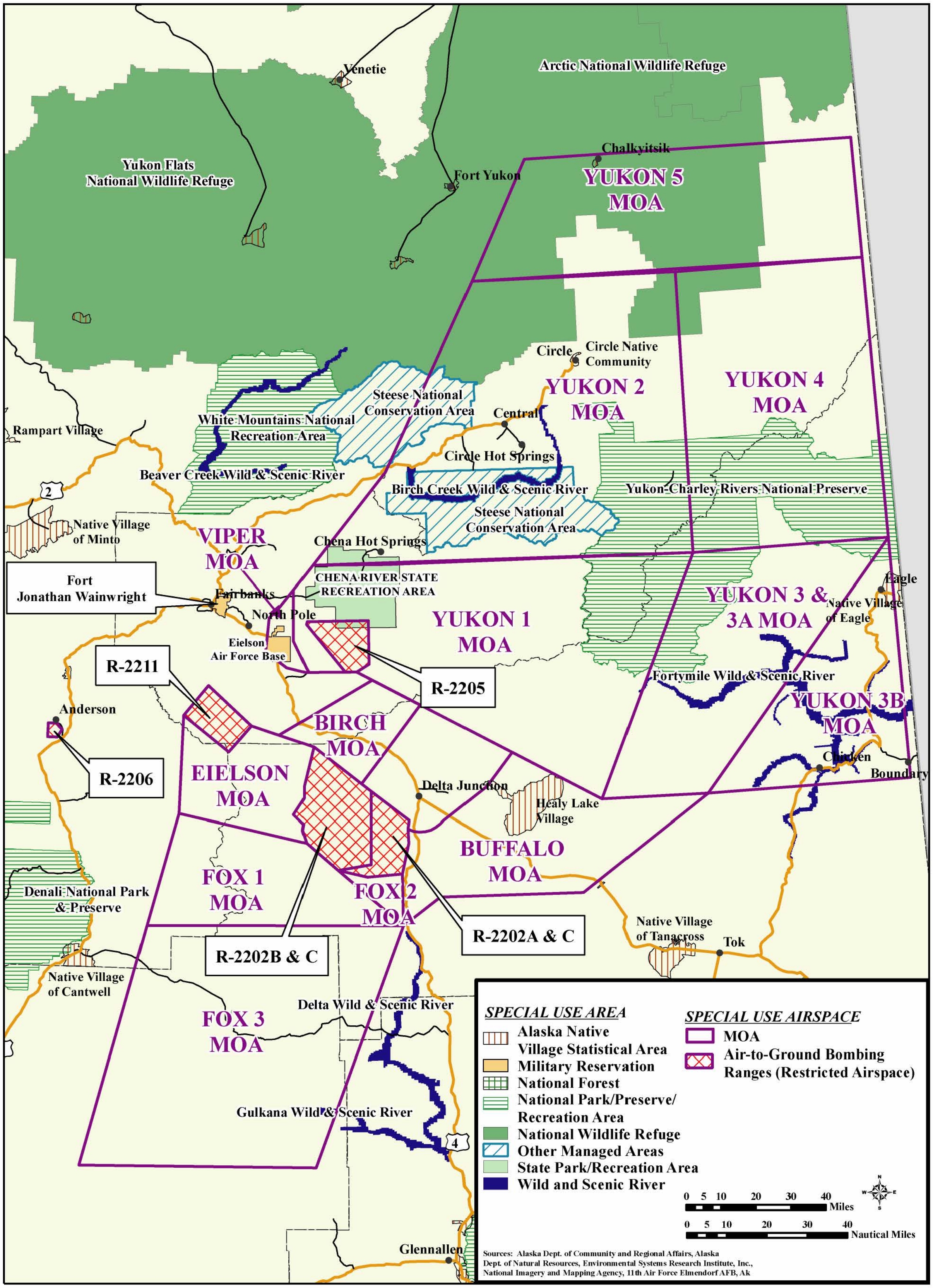


Figure 4.8-2. Special Use Areas Underlying Restricted Areas

Restricted Areas

With the exception of the Chena River State Recreation Area, no special land use areas occur under Restricted Areas. A small portion of the southern boundary of the Chena River State Recreation Area underlies Restricted Area 2205 (see Figure 4.8-2).

4.8.3 Environmental Consequences of Beddown

As the replacement for one F-15C squadron and one F-15E squadron at Elmendorf AFB, the two F-22A squadrons would conduct many of the same missions and training programs as the F-15C and F-15E. The Air Force expects the F-22A to use the training airspace associated with Elmendorf AFB in a manner similar to the F-15C and F-15E. No substantial change in sortie-operations is anticipated under the Proposed Action. The potential to affect land use within and under the airspace is slight. Such consequences would be indirect, stemming from aircraft overflights and aircraft noise.

Under the Proposed Action, subsonic noise would either decrease slightly or remain the same as under baseline conditions (refer to Section 3.2). Most annual average noise levels are expected to remain below 45 L_{dn}. Where noise levels are higher than 45 L_{dn}, they are expected to remain essentially the same under the Proposed Action as under existing conditions. The United States Environmental Protection Agency (USEPA) has identified an annual average noise level of 55 L_{dn} as a level to begin assessing the potential for noise impacts. With noise levels below 55 L_{dn} throughout the airspace, it is unlikely the land use patterns, ownership, or management practices would be affected by the use of the airspace for F-22A training.

Under the Stony MOAs, flight activities would increase sonic booms from the existing 15 to a projected 28 per month. Under the Stony, Fox, Naknek, and Yukon MOAs, sonic booms would increase by 1 to 4 per month (see Table 4.2-3). These changes are not likely to be detected except under the Stony MOAs. Under the Stony MOAs, residents and hunters, as well as visitors, could experience more sonic booms as a result of the increase in supersonic activities. It is possible that the increase in supersonic activity could be perceived by visitors to isolated areas as an unwanted intrusion that may impede management goals for special use areas under the MOAs.

Detected sonic booms have the potential to cause increased disturbance in recreational, hunting, or fishing areas. Under most airspaces, it is unlikely that any occasional visitor or hunter would discern the difference between the current number of sonic booms and the increased number associated with an F-22A beddown. Individuals who spend extensive time subsistence hunting and fishing under the Stony MOAs could discern an increase. The increased frequency of sonic booms would not be expected to affect land use or land use patterns, ownership, or management, but the increase could disturb some people.

Alaska Native Concerns

A number of Alaska Native villages and traditional subsistence areas underlie Alaskan SUA. Alaska Natives have expressed concern that existing and projected noise levels and sonic booms could affect recreational uses, as well as traditional hunting activity. In addition to being important social and cultural activities, the local economy is often dependent on subsistence activities. Scoping concerns were also raised regarding access to the villages such as potential conflicts between military and private aircraft. Private aircraft are an important means of accessing these remote villages and hunting areas. As noted above, average noise levels are not

expected to increase under the MOAs, and a detectible increase in sonic booms could result in annoyance, but would not be expected to affect subsistence activities. Higher training altitudes and increased F-22A pilot situational awareness with the enhanced systems should minimally improve flight safety for general aviation.

4.8.4 No Action

Under the No Action Alternative, the F-22A would not be based at Elmendorf AFB. The Air Force would continue to use the training airspace with Elmendorf AFB-based aircraft. No changes associated with aircraft overflights and aircraft noise to special land use or recreational areas would be anticipated.

4.9 Socioeconomics

Socioeconomic factors are defined as the basic attributes and resources associated with the human environment, including population and economic activity. Data for the socioeconomic analysis in this EA were obtained from the U.S. Bureau of the Census and the Alaska Departments of Commerce and Labor.

4.9.1 Definition

Socioeconomic resources evaluated include areas around Elmendorf AFB as well as geographic areas under or proximate to the training airspace. The nine geographic areas considered are:

- Anchorage Municipality – not under training airspace
- Bethel Census Area – partially under Stony MOAs
- Dillingham Census Area – partially under Naknek MOAs
- Fairbanks Northstar Borough – rural portions partially under Yukon MOAs and Viper A/B MOA
- Lake and Peninsula Borough – partially under Naknek 2 MOA
- Matanuska-Susitna Borough – rural portions partially under Susitna and Fox MOAs
- Southeast Fairbanks Census Area – partially under Yukon, Birch, and Buffalo MOAs
- Valdez-Cordova Census Area – not under training airspace
- Yukon-Koyukuk Census Area – partially under Galena and Stony MOAs

4.9.2 Existing Conditions

Lands under training airspace are very rural in nature, with sparsely scattered populations. With the exception of Anchorage Municipality, Fairbanks North Star, and the Matanuska-Susitna Borough, rural lands comprise two-thirds of the region and population density is 0.4 or fewer persons per square mile (see Table 4.9-1). The population centers are included for reference and they are not directly affected by training airspace. The average household size in the regions ranges from 2.80 persons per household in the southeast Fairbanks census area to 3.73 persons per household in the Bethel census area. By comparison, the state and Anchorage average household sizes are 2.74 and 2.62 persons per household, respectively. Housing vacancy rates range from a low of 18.5 percent in Bethel to a high of 62.2 percent in Lake and Peninsula Borough. The vacancy rates are primarily due to seasonal occupancy.

Table 4.9-1. Demographic Characteristics of Affected Regions (2000)

	Total Population	*Percent Rural*	*Population Density*	*Average Household Size*	*Housing Vacancy Rate*
State of Alaska	626,932	34.4	1.1	2.74	15.1
Anchorage Municipality	260,283	3.9	153.4	2.67	5.5
Bethel Census Area	16,006	72.3	0.4	3.73	18.5
Dillingham Census Area	4,922	100.0	0.3	3.20	34.4
Fairbanks North Star Borough	82,840	30.4	11.2	2.68	10.6
Lake and Peninsula Borough	1,823	100.0	0.1	3.10	62.2
Matanuska-Susitna Borough	59,322	64.5	2.4	2.84	24.8
Southeast Fairbanks Census Area	6,174	100.0	0.2	2.80	34.9
Valdez-Cordova Census Area	10,195	100.0	0.3	2.58	24.6
Yukon-Koyukuk Census Area	6,551	100.0	<0.1	2.81	41.1

Source: U.S. Bureau of the Census 2000a.

Economic activity in the regions away from population centers revolves primarily around Alaska's natural resources. Government and government enterprises provide many jobs in these regions and provide a measure of stability through year-round employment. Seasonal employment that includes commercial fishing, guided hunting, and related industries are an important source of income. Population in many of these areas fluctuates throughout the year in response to seasonal activity. Resource-based tourism, mining, and oil/gas pursuits also contribute to regional economic activity. For many residents, subsistence fishing and hunting are important and contribute substantially to people's diets and supplementary income.

Seasonal unemployment rates vary widely in the regions in response to fluctuations in resource-based employment. Average annual unemployment rates vary from 4.7 percent in Anchorage Municipality to 12.5 percent in the Yukon-Koyukuk Census Area, in comparison to the state's average unemployment rate of 6.1 percent (see Table 4.9-2). Median household income and per capita personal income vary considerably. With nearly 50 percent of the state's population in the city of Anchorage and its environs, the household and personal income of Anchorage dominate the statistics. Most rural regions experience income levels lower than Anchorage or Anchorage-driven average state levels.

Table 4.9-2. Economic Characteristics of Regions (2000)

	Total Employment	*Percent Unemployment*	*Median Household Income*	*Per Capita Personal Income*
State of Alaska	281,532	6.1	$51,571	$22,660
Anchorage Municipality	125,737	4.7	$55,546	$25,287
Bethel Census Area	5,481	9.1	$35,701	$12,603
Dillingham Census Area	1,765	7.2	$43,079	$16,021
Fairbanks North Star Borough	35,258	5.8	$49,076	$21,553
Lake and Peninsula Borough	581	7.9	$36,442	$15,361
Matanuska-Susitna Borough	24,981	6.7	$51,221	$21,105
Southeast Fairbanks Census Area	1,932	9.5	$38,776	$16,679
Valdez-Cordova Census Area	4,463	6.3	$48,734	$23,046
Yukon-Koyukuk Census Area	2,276	12.5	$28,666	$13,720

Source: U.S. Bureau of the Census 2000b.

4.9.3 Environmental Consequences of Beddown

A number of Alaska Native villages and traditional subsistence areas underlie Alaskan SUA. The local economy in many of these villages is based primarily on subsistence activities. The proposed change of training aircraft from two squadrons of F-15C and one squadron of F-15E to one squadron of F-15C and two squadrons of F-22A is not expected to discernibly affect annual average noise levels under the training airspace. The F-22A generally flies at higher altitudes and the resulting average noise levels are not greater than those experienced with the F-15C and F-15E training.

The single exception is in the area of sonic booms. The supersonic capabilities of F-22A aircraft permit it to fly at supersonic speed an estimated 25 percent of its training mission as opposed to 7.5 percent for the F-15C and F-15E training missions. Although the F-22A flies higher and thus the energy from sonic booms is more likely to dissipate, a noticeable increase in sonic booms from the existing 15 to a projected 28 per month under the Stony MOAs. This increase could be noticeable to individuals spending extended time under the airspace. The nature of sonic booms is such that they can be heard, often as a rolling thunder sound, in areas on the edge of the airspace boundaries. Sonic booms, or the increase in sonic booms, are not expected to significantly affect subsistence, recreational hunting or fishing, on the local economy. However, sonic booms could be viewed as unwelcome intrusions to activities in remote areas. For any damage claims associated with sonic booms, the Air Force has established procedures that begin with contacting the Elmendorf AFB Public Affairs Office.

Alaska Native Concerns

The economy of Alaska Native villages and traditional subsistence areas that underlie Alaskan SUA is often based on subsistence activities. Some Alaska Natives have expressed concerned that sonic booms could affect game in traditional hunting areas or military flights could affect the use of private aircraft to access hunting or fishing locations.

The change in sonic booms may be discernible to Alaska Natives or others residing under or using the land under the airspace for an extended period of time. Increases in sonic booms would not be expected to substantially affect subsistence or guided hunting or fishing. Elmendorf AFB has an established scheduling of airspace use to avoid, to the extent possible, training in airspace over areas at the beginning of hunting or fishing seasons reduces potential conflicts with subsistence and recreational hunting and fishing. For any damage claims associated with sonic booms, the Air Force has established procedures that begin with contacting the Elmendorf AFB Public Affairs Office.

Commentors during scoping wanted to know if military flights could affect the use of private aircraft and thereby potentially affect the local economy dependent on traditional subsistence activities. The F-22A improves pilot awareness of other aircraft and the F-22A flight profiles reduce low level military flights. The local economy dependent on traditional resources and on private aircraft would minimally benefit from the Proposed Action.

4.9.4 No Action

Under the No Action Alternative, no changes in flight activity, facilities, or personnel are anticipated. Annual average noise levels and supersonic training events would continue as at present.

4.10 Environmental Justice

EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, directs federal agencies to address environmental and human health conditions in minority and low-income communities. In addition to environmental justice concerns are those pursuant to EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, which directs federal agencies to identify and assess environmental health and safety risks that may disproportionately affect children.

For purposes of this analysis, minority, low-income and youth populations are defined as follows:

- *Minority Population*: Alaska Natives, persons of Hispanic origin of any race, Blacks, American Indians, Asians, or Pacific Islanders.
- *Low-Income Population*: Persons living below the poverty level.
- *Youth Population*: Children under the age of 18 years.

Estimates of these three population categories were developed based on data from the U.S. Bureau of the Census. The census does not report minority population, per se, but reports population by race and by ethnic origin. These data were used to estimate minority populations potentially affected by implementation of the Proposed Action. Low-income and youth population figures also were drawn from the Census 2000 Profile of General Demographic Characteristics.

4.10.1 Definition

As with socioeconomic resources, evaluation of environmental justice evaluates nine geographic areas that include areas under the affected airspace and large municipalities near the airspace:

- Anchorage Municipality – not under training airspace

- Bethel Census Area – partially under Stony MOAs
- Dillingham Census Area – partially under Naknek MOAs
- Fairbanks Northstar Borough – rural portions partially under Yukon MOAs and Viper A/B MOA
- Lake and Peninsula Borough – partially under Naknek 2 MOA
- Matanuska-Susitna Borough – rural portions partially under Susitna and Fox MOAs
- Southeast Fairbanks Census Area – partially under Yukon, Birch, and Buffalo MOAs
- Valdez-Cordova Census Area – not under training airspace
- Yukon-Koyukuk Census Area – partially under Galena and Stony MOAs

4.10.2 Existing Military Training in Special Use Airspace

Alaska Natives live on many land areas under the affected airspace. Specific communities are identified under specific airspace units in Section 4.7.2. Federally recognized Alaska Natives under the airspace include Crooked Creek, settled by Eskimo and Ingalik people; Georgetown, a seasonal fishing village; Lime village, a Dena'ina Athabascan Indian settlement; Red Devil, a village populated by a mix of Eskimo, Athabascan, and non-native inhabitants; Sleetmute, founded by Ingalik Indians; Stony River, a mix of Indian and Eskimo people; and Koliganek (U.S. Bureau of the Census 2000a). Other federally recognized Alaska Natives in the area include Eagle, Circle, Chalkyitsik, Dot Lake, and Healy Lake. Native lifestyle in many of these villages is based on or supplemented by subsistence activities. Alaska Native Corporations in the region are Cook Inlet, Calista, Doyon, and Bristol Bay. Additional baseline data on minority, low-income, and youth populations in areas under the airspace are presented in Table 4.10-1.

Table 4.10-1. Minority and Low-Income Populations by Area (2000)

	Total Population	*Percent Low-Income*	*Percent Minority*	*Percent Alaska Native*	*Percent Youth*
State of Alaska	626,932	9.4	32.4	15.4	30.4
Anchorage Municipality	260,283	7.3	30.1	7.0	29.1
Bethel Census Area	16,006	20.6	87.8	81.6	39.8
Dillingham Census Area	4,922	21.4	79.1	69.4	38.1
Fairbanks North Star Borough	82,840	7.8	24.0	6.8	30.1
Lake and Peninsula Borough	1,823	18.9	81.2	73.0	37.8
Matanuska-Susitna Borough	59,322	11.0	13.7	5.3	32.2
Southeast Fairbanks Census Area	6,174	18.9	22.6	12.6	32.8
Valdez-Cordova Census Area	10,195	9.8	25.3	13.0	29.6
Yukon-Koyukuk Census Area	6,551	23.8	76.0	70.4	35.0

Source: U.S. Bureau of the Census 2000a, 2005.

Based on 2000 Census data, the incidence of persons and families in the ROI with incomes below the poverty level generally exceeded state levels (see Table 4.10-1). Poverty rates in the affected regions under the training airspace ranged from a low of 18.9 percent in Lake and Peninsula and southeast Fairbanks to a high of 23.8 percent in Yukon-Koyukuk Census Area, compared to 9.5 percent of persons in the state and 7.3 percent of persons in Anchorage.

Minority persons represent between 22.6 percent and 87.8 percent of the regions' population. Alaska Natives are by far the largest minority group, accounting for nearly the entire minority population and comprising over two-thirds of the total population in some areas under the training airspace. By comparison, minority persons represent 32.4 percent of the state population, with Alaska Natives accounting for 15.4 percent of the state total population and 47.5 percent of the state minority population. Youths under the age of 18 comprise between 32.8 percent and 39.8 percent of the population under the airspace, compared to 30.4 percent at the state level and 29.1 percent in Anchorage.

4.10.3 Environmental Consequences of Beddown

Alaska Natives are primary users of the natural resources under the training airspace. For many residents, subsistence fishing and hunting are vital, contributing substantially to people's diets and providing much-needed supplementary income. Individuals from these groups have expressed concerns related to aircraft noise impacts on their villages and on subsistence hunting under the airspace. Under the Proposed Action, subsonic noise levels within the MOAs would be approximately the same or slightly less than currently occurs under the airspace. Increases in supersonic flight would increase the number of sonic booms noticeably under the Stony MOAs. The increase would be from an existing 15 to a projected 28 booms per month. Under the Fox MOAs and Yukon 3 MOAs, sonic booms would increase by 1 to 4 per month. Alaska Natives hunting or fishing under most of these airspaces would be unlikely to detect an increase. The increase in sonic booms under the Stony MOAs could disturb some individuals who discerned the change.

Alaska Natives and others participating in scoping meetings did not cite sonic booms as events that interfered with hunting or fishing activities. The Elmendorf airspace managers seek to take into consideration hunting and fishing seasons while scheduling airspace use for training. Continued attention to airspace scheduling, hunting and fishing seasons, and Alaska Native concerns in airspace management reduces the potential for environmental consequences associated with sonic booms.

The random nature and intensity of sonic booms throughout the area under an airspace make it impossible to avoid a specific community. Sonic boom intensity can vary from the rolling sound of distant thunder to a sharp double crack (see Appendix D). Although the number of sonic events would be expected to increase under specific MOAs, the booms would not be expected to disproportionately affect communities. The change in aircraft from F-15C and F-15E to F-22A and F-15C and associated changes in sonic booms would not be expected to disproportionately affect children.

The large rural Alaska Native population throughout the state of Alaska, as well as under the existing airspace, results in no disproportionate impacts expected to occur to any area of minority populations.

Alaska Native Concerns

As noted above, Alaska Natives live under many of the affected MOAs and they are primary users of the resources under the airspace. Section 4.9.3 explains why the Proposed Action would not be expected to discernibly affect small aircraft use, hunting, or fishing. The large rural Alaska Native population is located throughout the state of Alaska, as well as under the existing airspace. Use of training airspace is not projected to disproportionately impact minority populations under the airspace.

4.10.4 No Action

Under the No Action Alternative, no changes in flight activity, facilities, or personnel are anticipated. No change from existing supersonic training within the airspaces would occur.

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5.0 CUMULATIVE IMPACTS

5.1 Cumulative Effects analysis

The Council on Environmental Quality (CEQ) regulations stipulate that the cumulative effects analysis in an Environmental Assessment (EA) considers the potential environmental consequences resulting from "the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 Code of Federal Regulations [CFR] 1508.7). Chapter 3.0 discussed the baseline conditions and potential effects of the proposed F-22A beddown on environmental resources at Elmendorf Air Force Base (AFB). Chapter 4.0 discusses baseline conditions and potential consequences under the training airspace. Chapter 5.0 identifies and evaluates projects that are reasonably foreseeable that could cumulatively affect environmental resources in conjunction with the F-22A beddown at Elmendorf AFB and use of training airspace.

Assessing cumulative effects begins with defining the scope of other actions and their potential interrelationship with the Proposed Action or alternatives (CEQ 1997). The scope must consider other projects that coincide with the location and timetable of the Proposed Action and other actions. Cumulative effects analyses evaluate the interactions of multiple actions. The first steps of the environmental impact analysis process helped identify other potential and planned actions. During early community outreach efforts, the public and agencies were asked to provide information about ongoing regional projects and the potential interaction of the F-22A beddown at Elmendorf AFB with such projects. These initial discussions defined the Region of Influence (ROI), which in turn defined what actions should be considered cumulatively. The ROI for cumulative effects would have both spatial and temporal dimensions.

The CEQ (1997) identified and defined eight ways in which effects can accumulate: time crowding; time lag; space crowding; cross boundary; fragmentation; compounding effects; indirect effects; and triggers and thresholds. Furthermore, cumulative effects can arise from single or multiple actions, and through additive or interactive processes (CEQ 1997).

Actions not identified in Chapter 2.0 as part of the proposal, but that could be considered as actions connected in time or space (40 CFR 1508.25) (CEQ 1997) may include projects that affect areas on or near Elmendorf AFB, areas underlying the affected training airspace, as well as the airspace itself. This EA analysis addresses three questions to identify cumulative effects:

1. Does a relationship exist such that elements of the project alternatives might interact with elements of past, present, or reasonably foreseeable actions?
2. If one or more of the elements of the alternatives and another action could be expected to interact, would the alternative affect or be affected by impacts of the other action?
3. If such a relationship exists, does an assessment reveal any potentially significant impacts not identified when the alternative is considered alone?

An effort has been made to identify all actions that are being considered and that are in the planning phase at this time. To the extent that details regarding such actions exist and the actions have a potential to interact with the proposal, these actions are included in this cumulative analysis. This approach enables decision-makers to have the most current information available so that they can evaluate the environmental consequences of the Proposed Action.

5.1.1 Past, Present, and Reasonably Foreseeable Actions

This EA applies a stepped approach to provide decision-makers with not only the cumulative effects of the Proposed Action, but also the incremental contribution of past, present, and reasonably foreseeable actions.

5.1.1.1 Elmendorf AFB and Other Military Actions

Recent past and ongoing military action in the region were considered as part of the baseline or existing condition in the ROI. Each project (summarized in this section) was reviewed to consider the implication of each action and its synergy with the Proposed Action and beddown options. Of particular concern were potential overlap in affected area and project timing. Shared aircraft operations were also a consideration.

Elmendorf AFB is an active military installation that experiences continuous and rapid evolution of mission and training requirements. This process of change is consistent with the U.S. defense policy that the United States Air Force (Air Force) must be ready to respond to threats to American interest throughout the world. Any new construction must comply with land use controls.

The base, like other major military installations, also requires new construction, facility improvements, and infrastructure upgrades. Table 5.1-1 lists current and potential major construction projects anticipated to occur on the base. Table 5.1-2 lists current and anticipated future off base military and non-military projects.

5.1.1.2 Non-Federal Actions

Non-federal actions include projects of the State of Alaska, various cities within the ROI, and private projects. The municipality of Anchorage is a large urban area with multiple construction projects occurring, especially in the summer months. Specific major actions within the vicinity of Elmendorf AFB are summarized in Table 5.1-2.

5.1.2 Cumulative Effects Analysis

Airspace Management and Air Traffic Control

Beddown of the C-17 at Elmendorf AFB in combination with the Base Realignment and Closure (BRAC) action of moving Air National Guard C-130 aircraft from Kulis Air National Guard Base will increase Elmendorf AFB tower responsibilities. These actions should not substantially affect the AATA management of Anchorage airspace. Exchange of one F-15C squadron and one F-15E squadron for two F-22A squadrons will minimally reduce fighter aircraft traffic, and would not be expected to have an adverse cumulative effect in conjunction with other aircraft actions.

Noise

At Elmendorf AFB, noise conditions addressed for the F-22A beddown take into consideration the C-17 beddown, the Kulis C-130 relocation, and the F-15C and F-15E changes associated with BRAC. The noise analysis for the F-22A presented in Section 3.2 is effectively a cumulative analysis (see Figure 3.2-1). No substantial cumulative noise effects are anticipated off base other than those identified in Section 3.2.3. Noise effects under the airspace also reflect implementation of the BRAC actions that affect F-15C, F-15E, and C-130 aircraft.

Table 5.1-1. Potential Major Projects at Elmendorf AFB (Page 1 of 2)

Scheduled Project	*Implementation Date*	*Funding Type*
Construct F-15E Flight Simulator	2006	MILCON
Construct C-17 Maintenance Complex	2006	MILCON
Alter Hangar 18	2006	MILCON
Adal Survival Equipment Shop	2006	MILCON
Construct VA Clinic	October 06 – September 08	MILCON
Birch Hill (GO Quarters)	2006	
Cottonwood demo	2006	
Moose Haven new construction	2006	
Railhead Anch Port/Truck Loading Facility	2006	
Port of Anchorage Deployment Staging Area	2006	
Renovate Hangar 4	August 05 - August 06	O&M
OSI Renovations	October 05 – June 06	O&M
Red Flag Alaska Operations	2006 - 2007	O&M
Alcom Renovation	January 06 - January 08	O&M
Construct Large Airframe/Nose Dock Hangar	Through April 07	MILCON
Gym Additions/Alterations	Through April 07	MILCON
Construct New Mini-Mall	April 07 – March 08	MILCON
Construct New Dorm	Summer 07 – Summer 09	MILCON
Kodiak new construction	2007	
Raven Ridge new construction	2007	
Birch Hill neighborhood revitalization	2007	
Moose Haven neighborhood revitalization	2007	
Puffin Park demo and new construction	2007	
Ammo Supply Point Facility	2007	
Barracks Buyout	2007	
Replace Child Development Center	2007	
ABN Brigade Barracks Complex	2007	
Port Access Road	Fall 2008	MILCON
Construct Entomology Facility	2008	MILCON
Repair Arctic Utilities and Infra, PH 1/10	2008	MILCON
Replace Building 602 (Family Life Center)	2008	
Construct North Side Dining/In-Flight Kitchen	Summer 09 – Summer 10	MILCON
Construct 962 AACS Hangar	Summer 09 – Summer 11	MILCON
Repair Arctic Utilities and Infra, PH 2/10	2009	MILCON
New or Additional Chapel	2009	
Golf Course Club House	2009	
Construct Automated Vehicle Wash/Vehicle Operations	Summer 09 – Summer 10	MILCON
Renovate Denali Hall Into Lodging	Summer 09 - Fall 10	MILCON

Table 5.1-1. Potential Major Projects at Elmendorf AFB (Page 2 of 2)

Scheduled Project	*Implementation Date*	*Funding Type*
Construct Air Force/Joint PME Center	Summer 09 - Fall 10	MILCON
Construct New Avionics/PMEL	Summer 09 – Fall 10	MILCON
Construct Combat Alert Cells	2010	MILCON
Construct Visiting Quarters	2010	MILCON
Repair Arctic Utilities and Infra, PH 3/10	2010	MILCON
Rapid Deployment Facility	2010	
Outdoor Recreation Center	2010	
Auto Craft Shop	2010	
Outdoor Recreation Area	2010	
Fire Station Replacement	2010	
Skeet Range	2010	
Railhead Operations Facility	2010	
Construct PAX Terminal (AMC Project)	TBD	MILCON

Table 5.1-2. Current and Future Military and Non-Military Projects (Page 1 of 4)

Action	*Document*	*Description*
Military Projects		
Grady Highway Extension	Final EA Elmendorf AFB and Fort Richardson, AK June 2005	The Air Force has constructed a new access road and bridge connecting Elmendorf AFB to U.S. Army Fort Richardson to improve transportation between the two installations. The road and bridge is located entirely on Fort Richardson property and would become property of the Army upon completion of construction. The action improves fire and emergency response access between the installations, reduces traffic on Davis Highway, improves access to consolidated community services, and provides an alternate access route for Phase II Private Sector Financed housing on Elmendorf AFB.
Perimeter Fencing	N/A 2002 - 2003	Several fence projects have been completed. Airfield fencing totaling 1,653 acres was completed in 2002. Non-perimeter perimeter fencing was completed in 2003. This fence runs from the Government Hill Gate to Muldoon Gate and extends along housing, the golf course, and Glenn Highway. Airfield and non-perimeter fencing separate Elmendorf AFB from the public. The Port of Anchorage and Fort Richardson have controlled access to the installations.
C-17 Beddown	Final EA Elmendorf AFB, AK September 2004	The addition of new C-17 aircraft brings the Air Force Alaska airlift capabilities to state-of-the-art standards and increases its capacity. The 18 C-130 cargo aircraft fleet are scheduled to be replaced with 8 new C-17 aircraft, routine aircraft operations (both mission- and training-related), and the construction and use of support facilities on Elmendorf AFB. The C-130 aircraft are scheduled to depart Elmendorf AFB in 2006 and the C-17 aircraft are scheduled to arrive in 2007. New facilities would be constructed in a phased approach in an effort to minimize impacts to normal base operations.
C-17 Training Areas	Final EA Elmendorf AFB, AK November 2005	The C-17 training area project involves C-17 operations in Alaskan Special Use Airspace (SUA). The project also includes upgrading Runway 06/24 at Allen Army Airfield, frequent use of the runway as a C-17 assault landing zone, and frequent use of five existing drop zones for C-17 training.

Table 5.1-2. Current and Future Military and Non-Military Projects (Page 2 of 4)

Action	*Document*	*Description*
Transformation of US Army Alaska	Final EIS February 2004	This action is underway and includes accommodation for 4,000 more soldiers relocating from installations worldwide, as well as activation of a new airborne brigade. The action also transforms the 172^{nd} Infantry Brigade into a Stryker Brigade Combat Team. This includes changes to force structure and stationing, and modifications of ranges, facilities, and infrastructure designed to meet the objectives of Army transformation in Alaska. Elmendorf AFB uses Army ranges for air-to-ground training. Proposed locations for changes in force structure and stationing include Fort Wainwright and Fort Richardson. Proposed activity changes on Fort Wainwright would occur within the cantonment area, Tanana Flats Training Area, Yukon Training Area, and Donnelly Training Area.
Modification of MTR	Draft EA June 2005	The Air Force is proposing to modify existing MTRs within the state of Alaska to better connect the MTRs with existing special use airspace. These changed MTRs would be used by aircraft with low level navigation missions. The F-22A is expected to use MTRs substantially less frequently than, and at speeds similar to, the F-15E.
Fort Richardson/ Elmendorf AFB Joint Basing concept	BRAC 2005 Joint Basing Road Map Study	The Joint Basing Implementation Roadmap Study calls for 3 pilot studies that are currently underway investigating more efficient use of installations that are adjacent to one another but managed by different services (e.g. Army/Air Force, Navy/Air Force). Elmendorf and Fort Richardson, while not the subject of a pilot study, may implement the Joint Basing Concept as early as 2006. The BRAC timeframe extends to 2011. Initial efforts may include shared community service facilities, such as the current medical center. Demand for construction resources may be high.
Eielson BRAC projects	Identified as a BRAC action by BRAC Act of 2005	This project removes 354^{th} Fighter Wing assigned A-10 from Eielson AFB. Three A-10 aircraft would go to Barksdale AFB, Louisiana; 12 aircraft to Moody AFB, Georgia; and three to the backup inventory. F-16s would go to Nellis AFB, Nevada.
Kulis ANG BRAC projects	Identified as a BRAC action by BRAC Act of 2005	This project relocates the 176^{th} Air National Guard Wing and associated aircraft (8 C-130H, 3 HC-130N, and 5 HH-60) and expeditionary combat support to Elmendorf AFB. Elmendorf AFB construction would be approximately $155 million. Relocating Air National Guard C-130s replaces the C-130 aircraft moved from Elmendorf as part of the C-17 beddown.

Table 5.1-2. Current and Future Military and Non-Military Projects (Page 3 of 4)

Action	*Document*	*Description*
Non-Military Projects		
Knik Arm Crossing	Preliminary Draft EIS and Section 4(f) Evaluation December 2005	The Knik Arm Bridge and Toll Authority is the proponent of a $400 - $600 million dollar construction effort known as the Knik Arm Crossing Project. If constructed, the Municipality of Anchorage and the Mat-Su Borough would be linked by a bridge over the Knik Arm. The project has the potential to affect Elmendorf AFB since proposed access routes cross the base. This project is in the early stages of NEPA with field studies occurring within the project area and a preliminary draft EIS out for agency review.
Cherry Hill Gravel Site	Cherry Hill Gravel Extraction Draft EA September 2005	The Cherry Hill Borrow Site is located on Elmendorf AFB. The gravel removal could have some interaction with the construction that might occur on base. Anticipated work at Cherry Hill is expected from 2006 through 2010. The FONSI/FONPA was signed by the PACAF/CE on 1 March 2006.
North End Gravel Extension	North End Runway Material Extraction and Transport Preliminary Draft EA November 2005	This EA analyzes the potential impacts associated with material extraction activities at the North End Borrow Site and potential transportation corridors on Elmendorf, to meet a substantial portion of the fill requirements. A separate but related action proposes to meet the remaining portion of the Marine Terminal Redevelopment Project fill requirements (Cherry Hill Borrow Site). The 284-acre proposed North End Borrow Site is located 3.4 miles northeast of the Port of Anchorage and immediately north of the North/South Runway at Elmendorf. It includes several borrow pits which are currently in use for construction projects within Elmendorf. Approximately 5.7 million cubic yards of recoverable material suitable for use in the Marine Terminal Redevelopment project has been confirmed available at the North End Borrow Site, and an estimated additional 2.8 million cubic yards may be available in uninvestigated areas within the Proposed Action limits. The proposed haul route extends generally westward from the North End Borrow Site to the Port of Anchorage and traverses approximately 3.4 miles of presently unimproved roads and trails on Elmendorf. Approximately 20 acres are presently cleared and are active as borrow material sources. An additional six acres are recovering from previous borrow activities and revegetating with native species. The remaining 258 acres have not been used as a borrow sources and are either cleared to keep vegetation out of the North/South runway's approach clearance surface, or are fully vegetated.

Table 5.1-2. Current and Future Military and Non-Military Projects (Page 4 of 4)

Action	*Document*	*Description*
Port of Anchorage Expansion	Marine Terminal Redevelopment EA March 2005	The Port of Anchorage is located in close proximity to Elmendorf AFB. There are stages to the expansion project that are expected to span from 2006 to 2011. The construction in the area is expected to increase through all three phases of the project. There is overlap during proposed F-22A facilities construction.
Natural Gas Pipeline	Preliminary discussions between federal and state agencies	Alaska is pursuing the construction of a natural gas pipeline. This possible project is still in the early stages and has not yet received approval. While part of the construction staging and possibly a pipeline extension could occur in the Anchorage area, the construction would not be expected to begin until after the completion of F-22A facility construction.
Anchorage Municipal Code Revision	Municipality of Anchorage Planning Department Title 21 Public Review Draft #2	Title 21 is a section of the Anchorage Municipal Code regulating land use and development to protect and enhance the public health, safety, and general welfare of the community, and to implement the Anchorage 2020 – Anchorage Bowl Comprehensive Plan. The revision would include development techniques and design standards, support innovative land development, encourage economic development, implement recently adopted plans and policies, and streamline the review process.

Safety

Flight, ground, and explosives safety associated with the F-22A beddown are not expected to have any cumulative effects in conjunction with other past, present, and reasonably foreseeable actions. None of these actions except the potential bridge access routes could affect safety on the base or in base environs. The Air Force is working with the Knik Arm Bridge and Toll Authority to protect base safety and security. The cumulative effects of the BRAC F-15C and F-15E actions are included in the airspace analysis.

Air Quality

Construction projects at Elmendorf AFB (e.g., the new North Side Dining/In-Flight Kitchen, the Automated Vehicle Wash, the new Dorms, the Large Airframe/Nose Dock Hangar) would all add temporary construction emissions due to construction equipment combustion and fugitive dust. Operational emissions would increase as facilities and personnel are added to the base, but would be offset by a removal of older equipment and facilities, and by the increased efficiency and lower emissions of newer equipment.

Implementation of regional projects would add to the total air emissions in the region. The Grady Highway extension potentially lowers operational emissions as vehicles traveling the highway would drive more efficiently with lower traffic congestion. As the area is further developed, the new highway extension could lead to a net increase in overall emissions as it would open the way for further development in areas that are currently undeveloped. The C-17 beddown would result in a temporary increase in construction emissions, and a change in aircraft emissions in the region. The construction would occur in a phased approach to minimize impacts to normal base operations. The transformation of U.S. Army Alaska would increase personnel by 4,000 soldiers in the region, with an accompanying increase of payroll, secondary employment, and air emissions. The project includes construction projects, which would temporarily increase construction emissions as well. The modification of Military Training Route (MTR) project would result in an increase in low-altitude emissions (Air Force 2005a). The F-22A is expected to use MTRs substantially less frequently than, and at speeds similar to, the F-15E.

Physical Resources

Physical resources at Elmendorf AFB would be affected by the cumulative construction activities on base and at Fort Richardson. Several future construction projects are planned, resulting in increased construction disturbance to soils with potential to affect water resources, hazardous materials, hazardous wastes, or the Environmental Restoration Program (ERP). Best management practices (BMPs) would reduce the potential cumulative impacts.

Because the Proposed Action would not affect physical resources under the airspace, the Proposed Action would not contribute to cumulative effects to earth and water resources.

Biological Resources

Biological resources at Elmendorf AFB could be affected by cumulative construction activities on base and at Fort Richardson. Several future construction projects are planned, resulting in increased construction noise and disturbance to soils, vegetation, and wildlife. If any of these construction activities occur on undeveloped portions of the base, native vegetation, wetlands, or special-status species could be affected. These projects have been or will be subject to the

National Environmental Policy Act (NEPA) process and any impacts to biological resources would be identified. Cumulative effects of perimeter fencing has been included in Section 3.6.

Beluga whales in Cook Inlet could be affected by the increasing human activity and construction in the Knik Arm and along the adjacent shoreline. Examples included the Knik Arm Crossing and the Port of Anchorage Expansion.

No immediate adverse threats due to cumulative activities were identified for biological resources underneath the training airspace. The effects of aircraft noise from the proposed modification of MTRs in Alaska is a slight concern for wildlife species under these MTRs. However, the F-22As are expected to use these MTRs less than the F-15Es. Therefore, the Proposed Action would not contribute to cumulative noise effects under the MTRs.

Cultural Resources

All three options could impact cultural resources on Elmendorf AFB. Historic buildings could be demolished, construction or renovation could occur in a National Register of Historic Places (NRHP)-eligible historic district, and ground disturbance during construction could encounter previously unrecorded archaeological resources. Other unrelated projects in the general vicinity also have the potential to impact cultural resources could contribute to a cumulative impact.

Four projects, C-17 Beddown, Cherry Hill Gravel Extraction, North End Gravel Extraction, and Kulis Air National Guard BRAC, call for construction activities that could impact archaeological and architectural resources at Elmendorf AFB. The potential for impacts will depend on the type of new facilities and their proximity to architectural resources located in three NRHP-eligible Elmendorf historic districts. There is also the potential for construction related impacts to previously undocumented archaeological resources, should they exist.

Two off base projects also have the potential to contribute to cumulative impacts to area cultural resources. The Knik Arm Crossing project would construct a bridge connecting Anchorage and the Mat-Su Borough. As the project is proposed to involve extensive construction, it has the potential to impact cultural resources, should they exist within the ROI. Additionally, two of the three bridge access routes would traverse Elmendorf AFB, potentially impacting the viewshed and traffic use patterns within the NRHP-eligible historic districts. The state of Alaska is also pursuing the construction of a natural gas pipeline that could include construction in the Anchorage area that would also have the potential to impact cultural resources, contributing to area cumulative impacts.

All of these projects would be subject to compliance with NEPA and Section 106 of the National Historic Preservation Act (NHPA) with the result that adverse effects would be mitigated, reducing cumulative impacts that could occur.

Land Use, Transportation, and Recreation

Key elements of the Proposed Action, including flight activity, personnel changes and facility construction, are consistent with existing land use plans and would not be expected to substantially affect land use patterns or traffic circulation in the ROI. Implementation of certain foreseeable future actions however, is likely to generate land use and transportation effects in the vicinity of Elmendorf AFB. The Knik Arm Crossing Project is proposed to alter circulation by linking the Municipality of Anchorage and the Mat-Su Borough, potentially affecting development patterns in the region. In addition, two of the three proposed bridge access routes

would traverse Elmendorf AFB. Proposed expansion at the Port of Anchorage, just west of Elmendorf AFB, could alter land use and land ownership patterns, and increase traffic congestion. Construction of these and other reasonably foreseeable projects, depending on potential concurrent scheduling with the Proposed Action options, could increase pressure on regional infrastructure and construction resources. However, incremental effects of the options, which are minor, would not be expected to create significant or adverse cumulative effects to land use resources in the region.

Socioeconomics

Proposed personnel changes, facility construction and modification, and airspace activities associated with the Proposed Action are not expected to generate significant adverse impacts to populations or economic activity in the ROI. Economic pursuits in the region, including that related to Alaska Native subsistence activities, are not expected to experience any major limitations or negative effects under implementation of the Proposed Action separately or in conjunction with relevant past, present and reasonably foreseeable future actions. A number of both military and non-military projects would increase the demand for construction employment and activity in the region. Although the increase in economic activity associated with a specific project would be temporary, lasting only for the duration of the construction period, the cumulative effects of the construction projects create employment for the foreseeable future. Net Elmendorf personnel decreases under the Proposed Action options, and associated regional employment and population effects, would be mitigated by construction and the transformation of U.S. Army action at Fort Richardson, which involves an influx of approximately 4,000 personnel to the region.

Incremental effects of the F-22A beddown, in combination with potential impacts associated with the reasonably foreseeable future actions, would not be expected to create any significant or adverse cumulative effect to socioeconomic resources in the region.

Environmental Justice

Proposed personnel changes, facility construction and modification, and airspace activities associated with the Proposed Action are not expected to generate significant adverse impacts, separately or cumulatively, on minority, low-income, or youth populations in the ROI. The incremental effects of this proposal, in combination with potential impacts associated with the relevant past, present and reasonably foreseeable future actions, would also not be expected to have any cumulative environmental justice effects.

5.2 Other Environmental Considerations

5.2.1 Relationship Between Short-Term Uses and Long-Term Productivity

CEQ regulations (Section 1502.16) specify that environmental analysis must address "…the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity." Special attention should be given to impacts that narrow the range of beneficial uses of the environment in the long-term or pose a long-term risk to human health or safety. This section evaluates the short-term benefits of the proposal compared to the long-term productivity derived from not pursuing the proposal.

Short-term effects to the environment are generally defined as a direct consequence of a project in its immediate vicinity. Short-term effects could include localized disruptions and higher

noise levels in some areas. There are minor changes proposed to the overall number of sorties flown out of Elmendorf AFB. Noise levels would change very little from current conditions. The military training that occurs in the airspace results in noise effects that are transitory in nature. Noise effects would be short term and would not be expected to result in permanent or long-term changes in wildlife or habitat use. Under the F-22A Proposed Action, these short-term uses would have a negligible cumulative effect.

The F-22A proposal largely involves changes in building structures, as well as a new aircraft, and would not significantly impact the long-term productivity of the land. Continued use of chaff and flares would not negatively affect the long-term quality of the land, air, or water.

5.2.2 Irreversible and Irretrievable Commitment of Resources

Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that the uses of these resources have on future generations. Irreversible effects primarily result from the use or destruction of a specific resource (e.g., energy and minerals) that cannot be replaced within a reasonable time frame. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action.

For Elmendorf AFB, most impacts are short-term and temporary (such as air emissions from construction) or longer lasting, but negligible (such as noise). Construction would use materials (e.g., metal, wood, concrete) and energy (fuel, electricity) that would be irretrievably lost. Air Force and personal vehicle use would consume fuel, oil, and lubricants.

Training operations would involve consumption of nonrenewable resources, such as gasoline used in vehicles, and jet fuel used in aircraft. Training would also involve commitment of chaff and flares. None of these activities would be expected to significantly decrease the availability of minerals or petroleum resources or have cumulative environmental consequences.

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Appendix A
Characteristics of Chaff

APPENDIX A CHARACTERISTICS OF CHAFF

Chaff is currently authorized for use in the existing airspace and under the Proposed Action, training chaff would continue to be employed in the airspace. The chaff used during training consists of extremely small strands (or dipoles) of an aluminum-coated crystalline silica core. When released from an aircraft, chaff initially forms a sphere, then disperses in the air and eventually drifts to the ground. The chaff effectively reflects radar signals in various bands (depending on the length of the chaff fibers) and forms a very large image or electronic "cloud" of reflected signals on a radar screen. When the aircraft is obscured from radar detection by the cloud, the aircraft can safely maneuver or leave an area.

Chaff is made as small and light as possible so that it will remain in the air long enough to confuse enemy radar. The chaff fibers are approximately the thickness of a human hair (i.e., generally 25.4 microns in diameter), and range in length from 0.3 to over 1 inch. The weight of chaff material in the RR-170 or RR-188 shaft cartridge is approximately 95 grams or 3.35 ounces (Air Force 1997). Since chaff can obstruct radar, its use is coordinated with the Federal Aviation Administration (FAA). RR-170 combat chaff is used by F-15C and F-15E aircraft for training in Alaska Special Use Airspace (SUA). This chaff is the same size and the cartridge is the same as RR-188 chaff. RR-188 chaff has D and E band dipoles removed to avoid interference with FAA radar. RR-170 chaff dipoles are cut to disguise the aircraft and produce a more realistic training experience in threat avoidance.

Chaff Composition

Chaff is comprised of silica, aluminum, and stearic acid, which are generally prevalent in the environment. Silica (silicon dioxide) belongs to the most common mineral group, silicate minerals. Silica is inert in the environment and does not present an environmental concern with respect to soil chemistry. Aluminum is the third most abundant element in the earth's crust, forming some of the most common minerals, such as feldspars, micas, and clays. Natural soil concentrations of aluminum ranging from 10,000 to 300,000 parts per million have been documented (Lindsay 1979). These levels vary depending on numerous environmental factors, including climate, parent rock materials from which the soils were formed, vegetation, and soil moisture alkalinity/acidity. The solubility of aluminum is greater in acidic and highly alkaline soils than in neutral pH conditions. Aluminum eventually oxidizes to Al_2O_3 (aluminum oxide) over time, depending on its size and form and the environmental conditions.

The chaff fibers have an anti-clumping agent (Neofat – 90 percent stearic acid and 10 percent palmitic acid) to assist with rapid dispersal of the fibers during deployment (United States Air Force [Air Force] 1997). Stearic acid is an animal fat that degrades when exposed to light and air.

A single bundle of chaff consists of the filaments in an 8-inch long rectangular tube or cartridge, a plastic piston, a cushioned spacer, and two plastic end caps (1/8-inch thick, 1-inch x 1-inch or 1-inch x 2-inch). The chaff dispenser remains in the aircraft. The plastic end caps and spacer fall to the ground when chaff is dispensed. The spacer is a spongy material (felt) designed to absorb the force of release. Figure 1 illustrates the components of a chaff cartridge. Table 1 lists the components of the silica core and the aluminum coating. Table 2 presents the characteristics of RR-188 or RR-170 chaff.

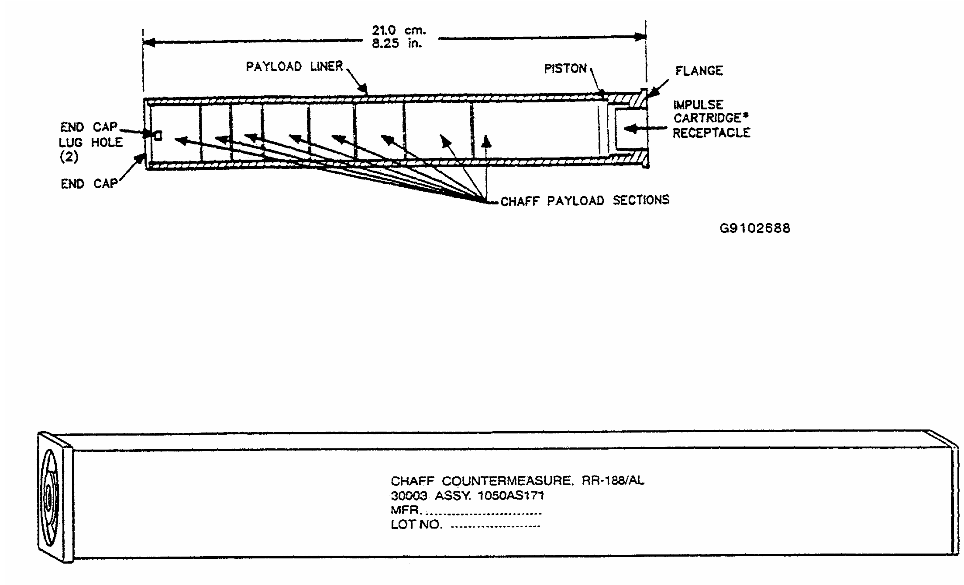

Figure 1. RR-188 or RR-170 Chaff Cartridge

Table 1. Components of RR-188 or RR-170 Chaff

Element	*Chemical Symbol*	*Percent (by weight)*
Silica Core		
Silicon dioxide	SiO_2	52-56
Alumina	Al_2O_3	12-16
Calcium Oxide and Magnesium Oxide	CaO and MgO	16-25
Boron Oxide	B_2O_3	8-13
Sodium Oxide and Potassium Oxide	Na_2O and K_2O	1-4
Iron Oxide	Fe_2O_3	1 or less
Aluminum Coating (Typically Alloy 1145)		
Aluminum	Al	99.45 minimum
Silicon and Iron	Si and Fe	0.55 maximum
Copper	Cu	0.05 maximum
Manganese	Mn	0.05 maximum
Magnesium	Mg	0.05 maximum
Zinc	Zn	0.05 maximum
Vanadium	V	0.05 maximum
Titanium	Ti	0.03 maximum
Others		0.03 maximum

Source: Air Force 1997

Table 2. Characteristics of RR-188 or RR-170 Chaff

Attribute	*RR-188*
Aircraft	F-15C, F-15E, F-22A
Composition	Aluminum coated silica
Ejection Mode	Pyrotechnic
Configuration	Rectangular tube cartridge
Size	8 x 1 x 1 inches (8 cubic inches)
Number of Dipoles	5.46 million
Dipole Size (cross-section)	1 mil (diameter)
Impulse Cartridge	BBU-35/B
Other Comments	Cartridge stays in aircraft; less interference with FAA radar (no D and E bands)

Source: Air Force 1997

The F-22A uses the same chaff material in a slightly different chaff cartridge to expedite clean ejection of the chaff. The chaff cartridge design is less likely to leave debris of any kind in the dispenser bay yet still provides robust chaff dispensing. Figure 2 is a photograph of this type of chaff cartridge. The RR-170B/AL for F-22A use has chaff packaged in soft packs that retain the same number of dipoles per cut as RR-170 chaff. The differences are a somewhat thicker (1/2-inch vs. 1/4-inch) end cap and three mylar wraps that facilitiate deployment. One end cap, one piston assembly, and three approximately 2-inch by 4-inch mylar pieces of wrap fall to the ground with each chaff cartridge deployed. The rubber bands in the photograph are removed before loading. RR-180A/AL chaff cartridges are dual cartridges with the same type of chaff material and mylar wrapping as RR-170B/AL chaff.

Chaff Ejection

Chaff is ejected from aircraft pyrotechnically using a BBU-35/B impulse cartridge. Pyrotechnic ejection uses hot gases generated by an explosive impulse charge. The gases push the small piston down the chaff-filled tube. A small plastic end cap is ejected, followed by the chaff fibers, and, in the case of F-22A chaff, three mylar pieces. The plastic tube remains within the aircraft. Debris from the ejection consists of two small, square pieces of plastic 1/8-inch thick (i.e., the piston and the end cap), three mylar strips, and the felt spacer. Table 3 lists the characteristics of BBU-35/B impulse cartridges used to pyrotechnically eject chaff.

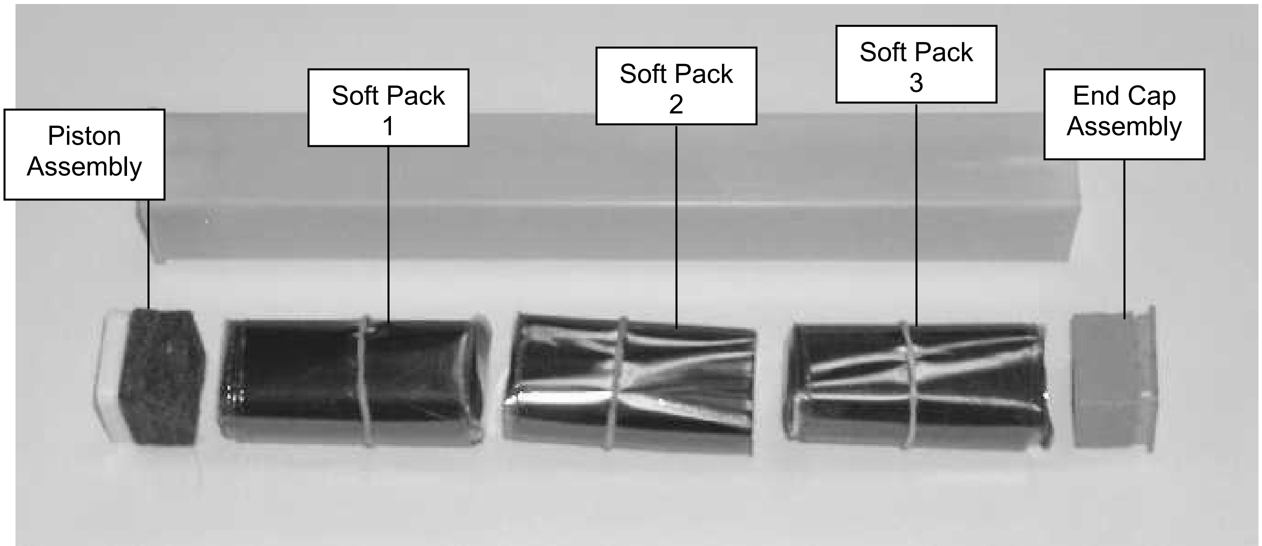

Figure 2. RR-170B/AL Layout

Table 3. BBU-35/B Impulse Charges Used to Eject Chaff

Component	*BBU-35/B*
Overall Size Overall Volume Total Explosive Volume	0.625 inches x 0.530 inches 0.163 inches^3 0.034 inches^3
Bridgewire	Trophet A 0.0025 inches x 0.15 inches
Initiation Charge	0.008 cubic inches 130 mg 7,650 psi boron 20% potassium perchlorate 80% *
Booster Charge	0.008 cubic inches 105 mg 7030 psi boron 18% potassium nitrate 82%
Main Charge	0.017 cubic inches 250 mg loose fill RDX ** pellets 38.2% potassium perchlorate 30.5% boron 3.9% potassium nitrate 15.3% super floss 4.6% Viton A 7.6%

Source: Air Force 1997

Upon release from an aircraft, chaff forms a cloud approximately 30 meters in diameter in less than one second under normal conditions. Quality standards for chaff cartridges require that they demonstrate ejection of 98 percent of the chaff in undamaged condition, with a reliability of 95 percent at a 95 percent confidence level. They must also be able to withstand a variety of environmental conditions that might be encountered during storage, shipment, and operation.

Table 4 lists performance requirements for chaff.

Table 4. Performance Requirements for Chaff

Condition	*Performance Requirement*	
High Temperature	Up to +165 degrees Fahrenheit	
Low Temperature	Down to –65 °F	
Temperature Shock	Shock from –70 °F to +165 °F	
Temperature Altitude	Combined temperature altitude conditions up to 70,000 feet	
Humidity	Up to 95 percent relative humidity	
Sand and Dust	Sand and dust encountered in desert regions subject to high sand dust conditions and blowing sand and dust particles	
Accelerations/Axis	G-Level	Time (minute)
Transverse-Left (X)	9.0	1
Transverse-Right (-X)	3.0	1
Transverse (Z)	4.5	1
Transverse (-Z)	13.5	1
Lateral-Aft (-Y)	6.0	1
Lateral-Forward (Y)	6.0	1
Shock (Transmit)	Shock encountered during aircraft flight	
Vibration	Vibration encountered during aircraft flight	
Free Fall Drop	Shock encountered during unpackaged item drop	
Vibration (Repetitive)	Vibration encountered during rough handling of packaged item	
Three Foot Drop	Shock encountered during rough handling of packaged item	

Note: Cartridge must be capable of total ejection of chaff from the cartridge liner under these conditions.
Source: Air Force 1997

Policies and Regulations on Chaff Use

Current Air Force policy on use of chaff and flares was established by the Airspace Subgroup of Headquarter Air Force Flight Standards Agency in 1993. It requires units to obtain frequency clearance from the Air Force Frequency Management Center and the FAA prior to using chaff to ensure that training with chaff is conducted on a non-interference basis. This ensures electromagnetic compatibility between the FAA, the Federal Communications Commission, and Department of Defense (DoD) agencies. The Air Force does not place any restrictions on the use of chaff provided those conditions are met (Air Force 1997).

Air Force Instruction (AFI) 13-201, U.S. Air Force Airspace Management, September 2001. This guidance establishes practices to decrease disturbance from flight operations that might cause adverse public reaction. It emphasizes the Air Force's responsibility to ensure that the public is protected to the maximum extent practicable from hazards and effects associated with flight operations.

AFI 11-214 Aircrew and Weapons Director and Terminal Attack Controller Procedures for Air Operations, July 1994. This instruction delineates procedures for chaff and flare use. It prohibits use unless in an approved area.

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_____. 1999. *Description of the Proposed Action and Alternatives (DOPAA) for the Expansion of the Use of Self-Protection Chaff and Flares at the Utah Test and Training Range, Hill Air Force Base, Utah*. Prepared for Headquarters Air Force Reserve Command Environmental Division, Robins AFB, Georgia.

Appendix B
Characteristics and Analysis of Flares

APPENDIX B CHARACTERISTICS AND ANALYSIS OF FLARES

1.0 Introduction

The F-15E and F-15C employ MJU-7 A/B and MJU-10/B self-protection flares in approved airspace over parts of Alaska. The F-22A uses MJU-10/B self-protection flares. Self-protection flares are magnesium pellets that, when ignited, burn for 3.5 to 5 seconds at 2,000 degrees Fahrenheit. The burn temperature is hotter than the exhaust of an aircraft, and therefore attracts and decoys heat-seeking weapons targeted on the aircraft. Flares are used in pilot training to develop the near instinctive reactions to a threat that are critical to combat survival. This appendix describes flare composition, ejection, risks, and associated regulations.

2.0 Flare Composition

Self-protection flares are primarily mixtures of magnesium and Teflon (polytetrafluoroethylene) molded into rectangular shapes (United States Air Force [Air Force] 1997). Longitudinal grooves provide space for materials that aid in ignition such as:

- First fire materials: potassium perchlorate, boron powder, magnesium powder, barium chromate, Viton A, or Fluorel binder.
- Immediate fire materials: magnesium powder, Teflon, Viton A, or Fluorel
- Dip coat: magnesium powder, Teflon, Viton A or Fluorel

Typically, flares are wrapped with an aluminum-coated mylar or filament-reinforced tape (wrapping) and inserted into an aluminum (0.03 inches thick) case that is closed with a felt spacer and a small plastic end cap (Air Force 1997). The top of the case has a pyrotechnic impulse cartridge that is activated electrically to produce hot gases that push a piston, the flare material, and the end cap out of the aircraft into the airstream. Table 1 provides a description of MJU-10/B and MJU-7 A/B flare components. Typical flare composition and debris are summarized in Table 2. Figure 1 is an illustration of an MJU-10/B flare, Figure 2 an illustration of an MJU-7 A/B flare. The MJU-7 (T-1) flare simulator is the same size as described for the MJU-7 A/B flare.

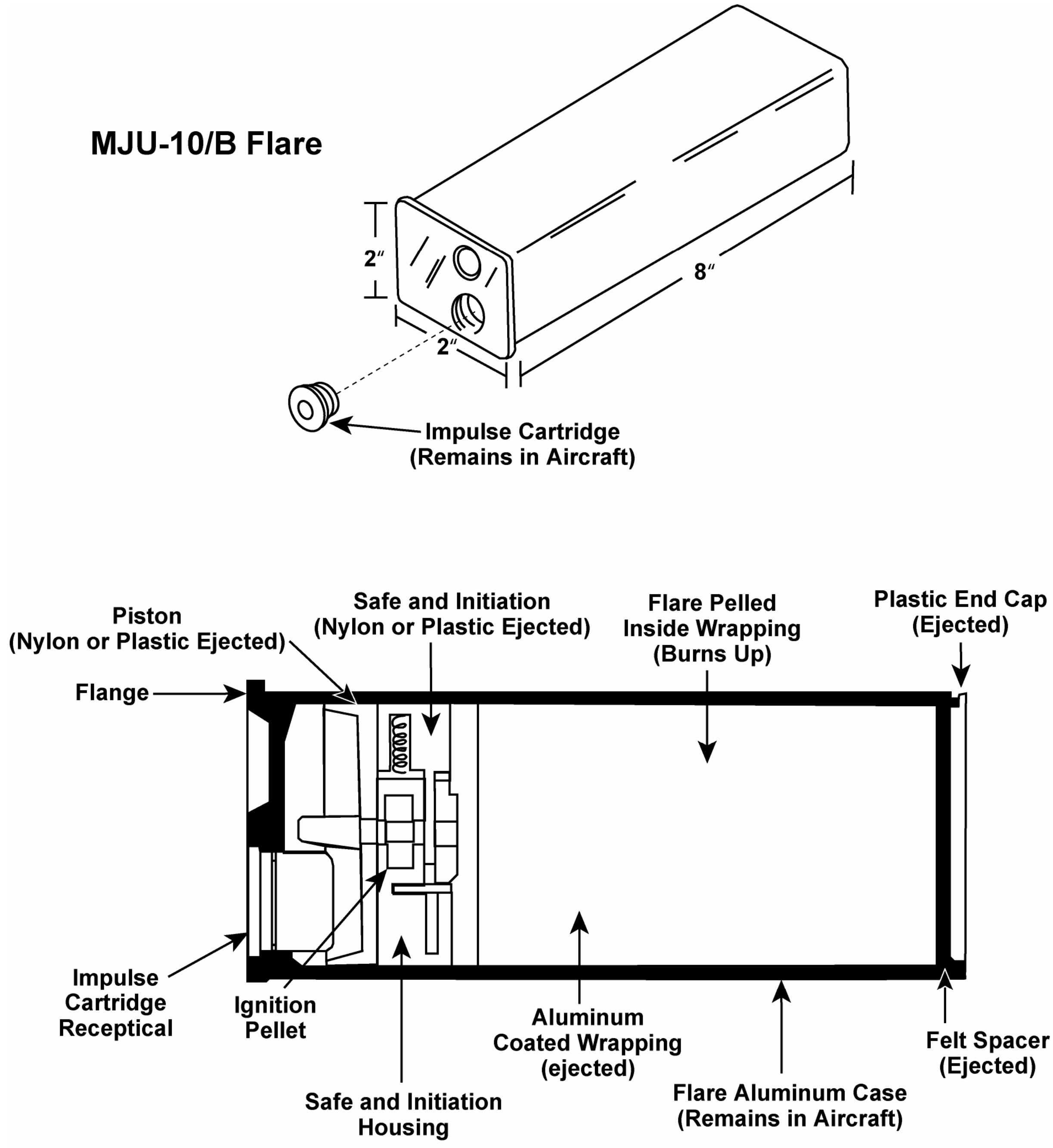
Table 1. Description of MJU-10/B and MJU-7 A/B Flares

Attribute	*MJU-10/B*	*MJU-7 A/B*
Aircraft	F-15, F-22	F-15
Mode	Semi-Parasitic	Semi-Parasitic
Configuration	Rectangle	Rectangle
Size	2 x 2 x 8 inches (32 cubic inches)	1 x 2 x 8 inches (16 cubic inches)
Impulse Cartridge	BBU-36/B	BBU-36/B
Safe and Initiation Device (S&I)	Slider Assembly	Slider Assembly
Weight (nominal)	40 ounces	13 ounces

Table 2. Typical Composition of MJU-10/B and MJU-7 A/B Self-Protection Flares

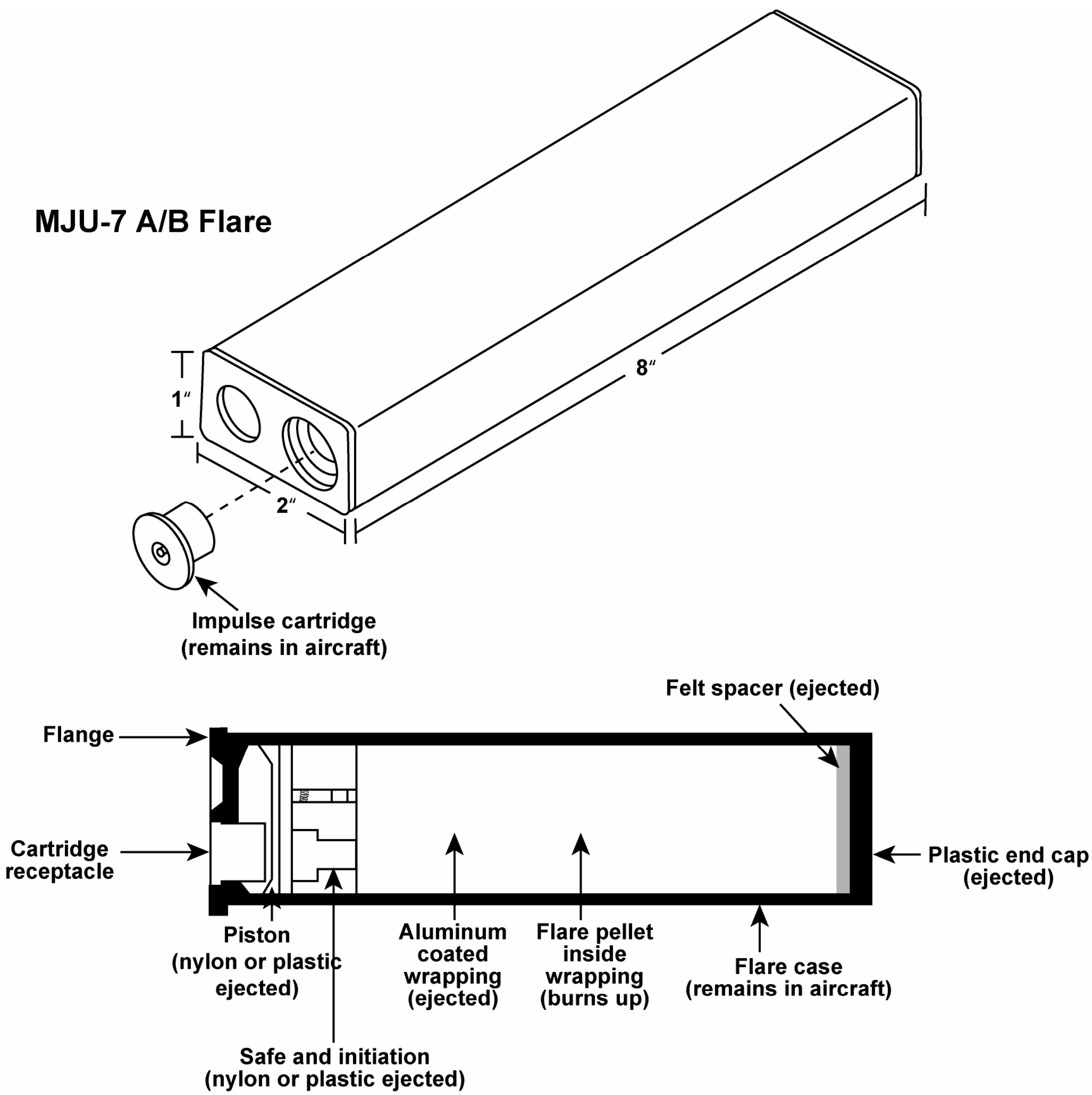
Part	*Components*
Combustible	
Flare Pellet	Polytetrafluoroethylene (Teflon) (-[C_2F_4]$_n$ – n=20,000 units) Magnesium (Mg) Fluoroelastomer (Viton, Fluorel, Hytemp)
First Fire Mixture	Boron (B) Magnesium (Mg) Potassium perchlorate ($KClO_4$) Barium chromate ($BaCrO_4$) Fluoroelastomer
Immediate Fire/ Dip Coat	Polytetrafluoroethylene (Teflon) (-[C_2F_4]$_n$ – n=20,000 units) Magnesium (Mg) Fluoroelastomer
Assemblage (Residual Components)	
Aluminum Wrap	Mylar or filament tape bonded to aluminum tape
End Cap	Plastic (nylon)
Felt Spacers	Felt pads (0.25 inches by cross section of flare)
Safe & Initiation (S&I) Device (MJU-7 A/B only)	Plastic (nylon, tefzel, zytel)
Piston	Plastic (nylon, tefzel, zytel)

Source: Air Force 1997



Source: T.O. 11A16-43-7

Figure 1. MJU-10/B Flare



Source: Air Force 1997

Figure 2. MJU-7 A/B Flare

3.0 Flare Ejection

The MJU-10/B and the MJU-7 A/B are semi-parasitic type flares that use a BBU-36/B impulse cartridge. In these flares, a slider assembly incorporates an initiation pellet (640 milligrams of magnesium, Teflon, and Viton A or Fluorel binder). This pellet is ignited by the impulse cartridge, and hot gases reach the flare as the slider exits the case, exposing a fire passage from the initiation pellet to the first fire mixture on top of the flare pellet. Table 3 describes the components of BBU-36/B impulse charges.

Flares are tested to ensure they meet performance requirements in terms of ejection, ignition, and effective radiant intensity. If the number of failures exceeds the upper control quality assurance acceptance level, the flares are returned to the manufacturer. A statistical sample is taken to ensure that approximately 99 percent must be judged reliable for ejection, ignition, and intensity. Flare failure would occur if the flare failed to eject, did not burn properly, or failed to ignite upon ejection. For training use within the airspace, a dud flare would be one that successfully ejected but failed to ignite. That probability is projected to be 0.01 percent based upon dud flares located during military range cleanup.

4.0 Risks Associated with Flare Use

Risks associated with the use of flares fall within two main categories: the risk of fire from a flare and the risk of being struck by a residual flare component.

4.1 Fire Risk

Fire risk associated with flares stems from an unlikely, but possible scenario which results in the flare reaching the ground or vegetation while still burning. The altitude from which flares are dropped is strictly regulated by the airspace manager, and is based on a number of factors including flare burn-out rate. The flare burn-out rate is shown in Table 4. Defensive flares typically burn out in 3.5 to 5 seconds, during which time the flare will have fallen between 200 and 400 feet. Specific defensive flare burn-out rates are classified. Table 4 is based on conditions that assume zero aerodynamic drag and a constant acceleration rate of 32.2 feet per second per second.

$D = (V_o * T) +(0.5 * (A * T^2))$

Where:

D = Distance
Vo = Initial Velocity = 0
T = Time (in Seconds)
A = Acceleration

Table 3. Components of BBU-36/B Impulse Charges

Component	*BBU-36/B*
Overall Size Overall Volume Total Explosive Volume	0.740 x 0.550 inches 0.236 cubic inches 0.081 cubic inches
Bridgewire	Trophet A
Closure Disk	Scribed disc, washer
Initiation Charge	
Volume	0.01 cubic inches
Weight	100 mg
Compaction	6,200 psi
Composition	42.5% boron 52.5 % potassium perchlorate 5.0% Viton A
Booster Charge	
Volume	0.01 cubic inches
Weight	150 mg
Compaction	5,100 psi
Composition	20% boron 80% potassium nitrate
Main Charge	
Volume	0.061 cubic inches
Weight	655 mg
Compaction	Loose fill
Composition	Hercules #2400 smokeless powder (50-77% nitrocellulose, 15-43% nitroglycerine)

Source: Air Force 1997

Table 4. Flare Burn-out Rates

Time (in Sec)	*Acceleration*	*Distance (in feet)*
0.5	32.2	4.025
1.0	32.2	16.100
1.5	32.2	36.225
2.0	32.2	64.400
2.5	32.2	100.625
3.0	32.2	144.900
3.5	32.2	197.225
4.0	32.2	257.600
4.5	32.2	326.025
5.0	32.2	402.500
5.5	32.2	487.025
6.0	32.2	579.600
6.5	32.2	680.225
7.0	32.2	788.900
7.5	32.2	905.625
8.0	32.2	1030.400
8.5	32.2	1163.225
9.0	32.2	1304.100
9.5	32.2	1453.025
10.0	32.2	1610.000

Note: Initial velocity is assumed to be zero.

4.2 Flare Strike Risk

Residual flare materials are those that are not completely consumed during ignition and fall to the ground, creating the risk of striking a person or property. Residual material from the MJU-10/B and the MJU-7 A/B consists of an end cap, an initiation assembly (safe and initiation device [S&I]), a piston, one or two felt spacers, and an aluminum-coated mylar wrapper (Table 5). For both flare types, the wrapper may be partially consumed during ignition, so the wrapping residual material could range in size from the smallest size, 1 inch by 1 inch, to the largest size, 4 inches by 13 inches. The size of the residual wrapping material would depend upon the amount of combustion that occurred as the flare was deployed.

Table 5. Residual Material from MJU-10/B and MJU-7 A/B Flares

Component	*Weight*
MJU-10/B	
End cap	0.0144 pounds
Safe & Initiation (S&I) device	0.0453 pounds
Piston	0.0144 pounds
Felt spacer	0.0025 pounds
Wrapper (4 inches x 13 inches)	0.0430 pounds
MJU-7 A/B	
End cap	0.0072 pounds
Safe & Initiation (S&I) device	0.0453 pounds
Piston	0.0072 pounds
Felt spacer	0.0011 pounds
Wrapper (3 inches x 13 inches)	0.0322 pounds

After ignition, as described in section 3.0, most residual components of the MJU-10/B and the MJU-7 A/B flare have high surface to mass ratios and are not judged capable of damage or injury when they impact the surface. One component of the MJU-10/B and the MJU-7 A/B flare, referred to as the S&I device, has a weight of approximately 0.725 ounces (0.0453 pounds). It is sized and shaped such that it is capable of achieving a terminal velocity that could cause injury if it struck a person.

The following discussion addresses the likelihood of an S&I device striking a person and the effect if such a strike were to occur.

4.2.1 Technical Approach

Elmendorf Air Force Base (AFB) aircraft training flights are distributed randomly and uniformly within the Military Operations Areas (MOAs). Avoidance areas that are designated for low altitude flight need not be avoided for higher altitude flight. Flare component release altitudes and angles of release are sufficiently random that ground impact locations of flare materials are also assumed to be uniformly distributed under the MOAs.

For any particular residual component of a released flare, the conditional probability that it strikes a particular object is equal to the ratio of the object area to the total area of the MOA. For multiple objects (i.e., people, structures, vehicles), the probability of striking any one object is the ratio of the sum of object areas to the MOA. The frequency of a residual component striking one of many objects is the frequency of releasing residual components times the conditional probability of striking one of the many objects per given release.

In equation form, this relationship is:

$$Strike\ frequency = component\ drop\ frequency\ in\ MOA \times \frac{area\ of\ object \times number\ of\ objects\ in\ MOA}{MOA(area)}$$

The potential consequences of a residual component with high velocity and momentum striking particular objects are postulated as follows:

- Striking the head of an unprotected individual: possible concussion
- Striking the body of an unprotected individual: possible injury
- Striking a private structure: possible damage
- Striking a private vehicle: possible damage (potential injury if vehicle moving)

The effect of the impact of a residual MJU-7 A/B or MJU-10/B component from Table 6 is judged by computing the component's terminal velocity and momentum.

Terminal velocity (V_T) is calculated by the equation:

$$V_T = \left[\frac{2}{\rho}\left(\frac{W}{A \times C_d}\right)\right]^{0.5} = 29 \times \left(\frac{W}{A}\right)^{0.5}$$

Where: V_T = Terminal Velocity (in Feet/Second)
ρ = Nominal Air Density (2.378×10^{-3} lbs-sec^2/feet^4)
W = Weight (in Pounds)
A = Surface Area Facing the Air stream (in feet^2)
C_d = Drag Coefficient = 1.0

Drag coefficients are approximately 1.0 over a wide range of velocities and Reynolds numbers (Re) for irregular objects (e.g., non-spherical). Using this drag coefficient, the computed terminal velocities (Table 7) produce Re values within this range ($Re < 2\times10^5$), which justifies the use of the drag coefficient.

The weights and geometries of major flare components are approximately as listed in Table 6.

Table 6. MJU-10/B and MJU-7 A/B Flare Major Component Properties

Component	*Geometry*	*Dimensions (inches)*	*Weight (Pounds)*
		MJU-10/B	
S&I device	Rectangular solid	2 x 0.825 x 0.5	0.0453
Piston	Rectangular open	2 × 2 × 0.25	0.0144
End Caps	Rectangular plate	2 × 2 × 0.125	0.0144
		MJU-7 A/B	
S&I device	Rectangular solid	2 × 0.825 × 0.5	0.0453
Piston	Rectangular open	2 × 0.825 × 0.5	0.0072
End Caps	Rectangular plate	1 × 2 × 0.125	0.0072

Terminal velocity momentums of these components are computed based on maximum (two square inches) and minimum (one square inch) areas and are listed in Table 7. Actual values would be between these extremes. The momentum values are the product of mass (in slugs) and velocity. A slug is defined as the mass that, when acted upon by a 1-pound force, is given an acceleration of 1.0 feet/sec^2.

Table 7. MJU-10/B and MJU-7 A/B Flare Component Hazard Assessment

Component	MAXIMUM SURFACE AREA			MINIMUM SURFACE AREA		
	Area (in^2)	*Terminal Velocity (ft/sec)*	*Momentum (lb-sec)*	*Area (in^2)*	*Terminal Velocity (ft/sec)*	*Momentum (lb-sec)*
MJU-10/B						
S&I device	1.65	58	0.08	0.41	115	0.16
Piston	4.0	21	0.009	0.50	59	0.03
End Cap	4.0	21	0.009	0.25	84	0.04
MJU-7 A/B						
S&I device	1.65	58	0.08	0.41	115	0.16
Piston	1.65	23	0.005	0.41	46	0.01
End Caps	2.0	21	0.005	0.13	84	0.02

The focus of this analysis will be the S&I device. Other flare components are not calculated to achieve a momentum that could cause damage.

The maximum momentum of the S&I device would vary between 0.08 and 0.16 pound-seconds depending upon orientation. In this momentum range, an injury is postulated that could be equivalent to a bruise from a large hailstone. Approximately 20 percent of any strikes could be to the head. A potentially more serious injury could be expected if the head were struck.

As a basis of comparison, laboratory experimentation in accident pathology indicates that there is a 90 percent probability that brain concussions would result from an impulse of 0.70 pound-seconds to the head, and less than a 1 percent probability from impulses less than 0.10 pound-seconds (Air Force 1997). The only MJU-7 A/B or MJU-10/B component with momentum values near 0.10 pound-seconds is the S&I device with a momentum between 0.08 and 0.16 pound-seconds. A strike of an S&I device to the head has approximately a 1 percent probability of causing a concussion.

What would be the likelihood of a hailstone sized S&I device striking an individual? People at risk of being struck by a dropped S&I device are assumed to be standing outdoors under a MOA (people in structures or vehicles are assumed protected). The dimensions of an average person are approximately 5 feet 6 inches high by 2 feet wide by 1 foot deep (men 5 feet 10 inches; women 5 feet 4 inches; children varied). The S&I device is expected to strike ground objects at an angle of 80 degrees or greater to the ground, assuming 80 degrees to the ground allows for possible wind or other drift effects. With the flare component falling at 80 degrees to the ground, a person's body ($5.5 \times 2 \times 1$ feet) projects an area of 3.9 $feet^2$ normal to the path of the dropped component. In a normal case, a person would be outdoors and unprotected 10 percent of the time based on Department of Energy and Environmental Protection Agency national studies (Tennessee Valley Authority 2003; Klepeis et al. 2001). In the case of hunting or fishing, a person is assumed to be out of doors and unprotected 2/3 of the day (although a person would probably be wearing a hat or other head covering during such activity).

The frequencies of a strike to an unprotected person can be computed based on the data and assumptions presented above. Flight maneuvers to deploy flares are assumed to be randomly distributed throughout the training airspace.

A personnel injury could occur if an S&I device struck an unprotected person. The frequency of striking a person is:

$$Injury\ frequency = comp\ drop\ freq \times \frac{body\ area \times pop.density \times Fract\ unprot \times MOA(area)}{MOA(area)}$$

Under the Stony MOAs, this calculates to approximately:

$$Injury\ frequency = 10{,}000 / year \times 3.9\ ft^2 / pers \times 0.1\ pers / mi^2 \times 0.67 \times 3.59 \times 10^{-8}\ mi^2 / ft^2$$
$$= 0.00009 \text{ injuries/year}$$

This means that in a representative Alaskan rural area beneath a MOA used extensively for pilot training (see Table 2.2-4), the annual expected person strike frequency would be less than one person in every 10,000 years.

The maximum momentum of the S&I device, either from an MJU-7 A/B or an MJU-10/B flare, would vary between 0.08 and 0.16 pound-seconds depending upon orientation of the falling S&I device. In this momentum range, an injury is postulated that could be equivalent to a bruise from a large hailstone. Approximately 20 percent of any strikes could be to the head.

As a basis of comparison, laboratory experimentation in accident pathology indicates that there is a less than a 1 percent probability of a brain concussion from an impulse of less than 0.10 pound-seconds to the head, and a 90 percent probability that brain concussions would result from an impulse of 0.70 pound-seconds to the head (Air Force 1997). The only MJU-7 A/B or MJU-10/B component with momentum values near 0.10 pound-seconds is the S&I device with a momentum between 0.08 and 0.16 pound-seconds. A strike of an S&I device to the head has approximately a 1 percent probability of causing a concussion.

This means that there would be an approximately 1 in 100 chance of a concussion in 10,000 years of flare use over the Stony MOAs. This level of risk is negligible.

The S&I device maximum momentum would vary between 0.08 and 0.16 pound-seconds depending upon orientation. A strike to a vehicle could cause a cosmetic dent similar to a hailstone impact. Although not numerically estimated, a strike to a moving vehicle could result in a vehicle accident.

5.0 Policies and Regulations Addressing Flare Use

Air Force policy on flare use was established by the Airspace Subgroup of Headquarters Air Force Flight Standards Agency in 1993 (Memorandum from John R. Williams, 28 June 1993) (Air Force 1997). This policy permits flare drops over military-owned or controlled land and in Warning Areas. Flare drops are permitted in MOAs and Military Training Routes (MTRs) only when an environmental analysis has been completed. Minimum altitudes must be adhered to. Flare drops must also comply with established written range regulations and procedures.

Air Force Instruction (AFI) 11-214 prohibits using flare systems except in approved areas with intent to dispense, and sets certain conditions for employment of flares. Flares are authorized over government-owned and controlled property and over-water Warning Areas with no minimum altitude restrictions when there is no fire hazard. If a fire hazard exists, minimum altitudes will be maintained in accordance with the applicable directive or range order. An Air Combat Command supplement to AFI 11-214 (15 October 2003) prescribes a minimum flare

employment altitude of 2,000 feet above ground level (AGL) over non-government owned or controlled property (Air Force 1997).

Elmendorf AFB has a more stringent policy regarding flare use than that outlined in AFI 11-214. Within Elmendorf AFB airspaces approved for flare use, flares may only be deployed above 5,000 feet AGL from June 1 through September 30. For the remainder of the year, the minimum altitude for flare use is 2,000 feet AGL.

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Appendix C
Distribution List and Agency Coordination

EA Distribution List

11th Air Force, Commander MG Brown, USA-AK, Bldg # 1, Ft. Richardson, AK 99505
Alaska Federation of Natives, Julie Kitka, President/CEO, 1577 C Street, Suite 300, Anchorage, AK 99501-5113
Alaska Railroad Corporation, Patrick Gamble, Chief Engineer, P.O. Box 107500, Anchorage, AK 99510-7500
Alaska Resources Library and Information Services, 3211 Providence Dr., Anchorage, AK 99508
Alaska State Court Law Library, 820 W. 4th Avenue, Anchorage, AK 99501
Alaska State Library, P.O. Box 110571, Juneau, AK 99811
Anchorage Assembly, Ken Stout, P.O. Box 196650, Anchorage, AK 99519-6650
Anchorage School District, Carol Comeau, Superintendent, 4600 DeBarr Rd., P.O. Box 6614, Anchorage, AK 99508-6614
Bureau of Land Management, Anchorage District Field Office, Clinton Hanson, 6881 Abbott Loop Rd., Anchorage, AK 99507
Chalkyitsik Village, Paul Edwin, First Chief, P.O. Box 57, Chalkyitsik, AK 99788
Chickaloon Village Traditional Council, Gary Harrison, P.O. Box 1105, Chickaloon, AK 99788-0057
Circle Hot Springs Resort, P.O. Box 30069, Circle, AK 99730
Circle Village Council, Paul Nathaniel, First Chief, P.O. Box 89, Circle, AK 99733
Delta Community Library, 2288 Deborah St., Delta Junction, AK 99737
Directorate of Public Works, Kevin Gardner, Environmental Planner, 730 Quartermaster Road, Atten: APVR-RPW-EV, Fort Richardson, AK 99505
Dot Lake Village Council, William Miller, President, P.O. Box 2275, Dot Lake, AK 99737-2275
Eagle School Library, General Delivery, Eagle, AK 99738
Eagle Traditional Council, David Howard, First Chief, P.O. Box 19, Eagle, AK 99738-0019
Elmendorf Library, 3rd Services Squadron, 10480 22nd Street, Elmendorf AFB, AK 99506
Fairbanks North Star Borough Public Library, Noel Wien Library, 1215 Cowles St., Fairbanks, AK 99701-4313
Fairview Community Council, Darrell Hess, 328 E. 15th Ave., #1, Anchorage, AK 99501
Government Hill Community Council, Stephanie Kesler, P.O. Box 100018, Anchorage, AK 99510-0018
Gwichyaa Zhee Gwich'in Tribal Govt., Adlai Alexander, Chief, P.O. Box 126, Fort Yukon, AK 99740-0126
Healy Lake Traditional Council, Ben Saylor, President, P.O. Box 60300, Fairbanks, AK 99706-0300
Igiugig Village Council, Michael Andrew, Jr., President, P.O. Box 4008, Igiugig, AK 99613-4008
Iliamna Village Council, Tim Anelon, President, P.O. Box 286, Iliamna, AK 99606-0286
King Salmon Village Council, P.O. Box 68, King Salmon, AK 99613-0068
Knik Tribal Council, Michael Tucker, President, P.O. Box 871565, Wasilla, AK 99687-1565
Kokhanok Village Council, Tisha O'Domin, President, P.O. Box 1007, Kokhanok, AK 99606-1007
Lime Village School, Attn: Library, Lime Village-McGrath, AK 99627
Lime Village Traditional Council, Joe Bobby, President, P.O. Box LVD, McGrath, AK 99627-8999
Louden Village Council, Peter Captain, Sr., First Chief, P.O. Box 244, Galena, AK 99741-0244
Martin Monsen Regional Library, 101 Main St., P.O. Box 147, Naknek, AK 99633
McGrath Community Library Association, P.O. Box 249, McGrath, AK 99627
Mountain View Community Council, Hugh Wade, 733 N. Flower St., Anchorage, AK 99508
Municipality of Anchorage, Anchorage Municipal Assembly, Municipal Clerk's Office, Anna Fairclough, 632 W. 6th Ave., Ste. 160, Anchorage, AK 99501

Municipality of Anchorage, Department of Community Planning and Development, P.O. Box 196650, Anchorage, AK 99519
Municipality of Anchorage, Mary Jane Michaels, Director, Community and Economic Development, P.O. Box 196650, Anchorage, AK 99519-6650
Naknek Village Council, Steven Angasan, President, P.O. Box 106, Naknek, AK 99633-0106
National Marine Fisheries Service, Brian Lance, 222 W. 7th Ave., Rm. 517, Anchorage, AK 99513
National Park Service, Alaska Regional Office, ATTN: Regional Director, 2525 Gambell St., Anchorage, AK 99503-2838
Native Village of Cantwell, Gordon Carlson, President, P.O. Box 94, Cantwell, AK 99729-0094
Native Village of Eklutna, Dorothy Cook, President, 26339 Eklutna Village, Chugiak, AK 99567-5148
Native Village of Tanana, P.O. Box 13, Tanana, AK 99777-0013
Native Village of Tyonek (IRA), Carol Burnell, P.O. Box 82009, Tyonek, AK 99682-0009
Nenana Native Village Association, Edna Hancock, First Chief, P.O. Box 369, Nenana, AK 99760-0369
New Koliganek Village Council, Herman Nelson, Sr., President, P.O. Box 5057, Koliganek, AK 99576-5057
Newhalen Tribal Council, Raymond Wassillie, President, P.O. Box 207, Iliamna, AK 99606-0207
Nondalton Tribal Council, Jack Hobson, Sr., President, P.O. Box 49, Nondalton, AK 99640-0049
Northeast Community Council, Bob Roses, Chair, 8200 E. 2nd Ave., Anchorage, AK 99504
Pedro Bay Village Council, Keith Jensen, President, P.O. Box 47020, Pedro Bay, AK 99647-0020
Port McKenzie, Matanuska-Susitna Borough, Marc VanDongen, Director, 350 East Dahlia Ave, Palmer, AK 99645
Port of Anchorage, William Sheffield, 2000 Anchorage Port Rd., Anchorage, AK 99501
Red Devil Traditional Council, Tommy Willis, President, P.O. Box 61, Red Devil, AK 99656-0061
Gary Rolf, Eagle River, AK 99577
Ruby Tribal Council, Donald Honea, First Chief, P.O. Box 210, Ruby, AK 99768-0210
Sleetmute School, P.O. Box 69, Sleetmute, AK 99668
Sleetmute Traditional Council, Pete Mellick, President, P.O. Box 34, Sleetmute, AK 99668-0034
State of Alaska, Department of Environmental Conservation, Jim Freechione, Anchorage Office, ADEC, 555 Cordova St., Anchorage, AK 99501
State of Alaska, Department of Fish and Game, Division of Wildlife Conservation, Grant Hilderbrand, Regional Supervisor, 333 Raspberry Rd., Anchorage, AK 99515
State of Alaska, Department of Military and Veteran Affairs, Craig Campbell, Major General, P.O. Box 5800 Camp Denali, Ft. Richardson, AK 99505-5800
State of Alaska, Department of Natural Resources, Michael Menge, Commissioner, 550 W. 7th St., Ste. 500, Anchorage, AK 99501-3561
State of Alaska, Department of Transportation, Central Region Office, Dave Eberle, Director, 4111 Aviation Ave., Anchorage, AK 99519
State of Alaska, Division of Governmental Coordination, Sue Magee, 550 W. 7th Ave., Ste. 1660, Anchorage, AK 99501
Tanacross Village Council, Jerry Isaac, President, P.O. Box 76009, Tanacross, AK 99776-6009
Tribal Council Office, General Delivery, Venetie, AK 99781
U.S. Army Alaska, Kevin Gardner, Directorate of Public Works, 730 Quartermaster Rd., Fort Richardson, AK 99505
U.S. Army Corp of Engineers, Stephen Boardman, Deputy Chief, Project Management Division, P.O. Box 6898, Elmendorf AFB AK 99506

U.S. Department of Agriculture, NRCS, 510 L Street, Anchorage, AK 99501-1935
U.S. Department of Commerce, NOAA, NMFS, Alaska Region - Anchorage Office, ATTN: Protected Resources and Habitat Conservation Divisions, 222 W. 7th Ave., Box 43, Anchorage, AK 99513-7577
U.S. Department of Interior, Bureau of Indian Affairs, Alaska Regional Office, ATTN: Regional Director, 3601 C St., Anchorage, AK 99503-5952
U.S. Department of Interior, Office of Environmental Policy, 1689 C Street, Rm. 119, Anchorage, AK 99501
U.S. Department of Transportation, Federal Aviation Administration, Patrick Poe, 222 W. 7th Ave., Anchorage, AK 99513
U.S. Department of Transportation, Federal Highway Administration, Alaska Division, P.O. Box 21648, 709 W. 9th St., Rm. 851, Juneau, AK 99802-1648
U.S. Department of Transportation, Federal Transit Administration - Region 10, Jackson Federal Building, 915 Second Ave., Ste. 3142, Seattle, WA 98174-1002
U.S. Department of Transportation, Maritime Administration, Michael Carter, 400 7th St. SW, Rm. 7310, MAR-800, Washington, DC 20590
U.S. Department of Transportation, Region 10 Federal Transit Administration, 915 Second Ave., Ste. 3142, Anchorage, AK 99513
U.S. Environmental Protection Agency, Marcia Combes, 222 W. 7th Ave., #19, Anchorage, AK 99513-7588
U.S. Fish and Wildlife Service, ATTN: Regional Wilderness Coordinator/NEPA Specialist, 1011 E. Tudor, MS 221, Anchorage, AK 99503-6103
U.S. House of Representatives, The Honorable Don Young, Congressman, 101 12th Avenue, #10, Fairbanks, AK 99701-6275
U.S. House of Representatives, The Honorable Don Young, Congressman, 2111 Rayburn HOB, Washington, DC 20515
U.S. Senate, The Honorable Lisa Murkowski, U.S. Senator, 510 L St., Ste. 550, Anchorage, AK 99501
U.S. Senate, The Honorable Lisa Murkowski, U.S. Senator, 709 Hart Senate Building, Washington, DC 20510
U.S. Senate, The Honorable Ted Stevens, U.S. Senator, 222 W. 7th Avenue, #2, Anchorage, AK 99513
U.S. Senate, The Honorable Ted Stevens, U.S. Senator, 522 Hart Senate Office Building, Washington, DC 20510
United States Coast Guard, Marine Safety Office, 510 L St., Ste. 100, Anchorage, AK 99501-1946
University of Alaska Fairbanks, Elmer E. Rasmuson Library, P.O. Box 756811, Fairbanks, AK 99775
Venetie Tribal Govt. (IRA), Mary Gamboa, President, P.O. Box 81080, Venetie, AK 99781-0080
Village Council Building, General Delivery, Chalkyitsik, AK 99788
Village of Stony River, Tom Willis, President, P.O. Box SRV, Stony River, AK 99557-8998
Wasilla Public Library, 391 N. Main St., Wasilla, AK 99654

Community outreach and scoping handouts and Interagency and Intergovernmental Coordination for Environmental Planning (IICEP) letters provided by the Air Force in late 2005 and early 2006 included information on 48 Primary Aircraft Inventory (PAI) as the Proposed Action. Since that time, the number of aircraft has been modified to 36 PAI.

DEPARTMENT OF THE AIR FORCE
PACIFIC AIR FORCES

20 December 2005

MEMORANDUM FOR U.S. Fish and Wildlife Service
ATTN: Ann Rappoport
605 W. 4th Ave., Room G61
Anchorage AK 99501-2250

FROM: 3 CES/CC
6326 Arctic Warrior Drive
Elmendorf AFB AK 99506-3240

SUBJECT: F-22 Beddown Environmental Assessment

1. The United States Air Force (Air Force) is preparing an Environmental Assessment (EA) to assess the potential environmental consequences of a proposal to locate, or "beddown," 48 operational F-22 aircraft at Elmendorf AFB (refer to attachment 1). One existing F-15C squadron and one existing F-15E squadron would be relocated from Elmendorf AFB concurrently with the proposed two squadron F-22 beddown. The EA will address changes in personnel, alternative locations and numbers of facilities to support the proposed beddown (refer to attachment 2), and a no action alternative that does not beddown F-22 aircraft at Elmendorf AFB. F-22 training is proposed for existing airspace and ranges utilized by the F-15C and F-15E aircraft (refer to attachment 3). None of the alternatives under consideration would require expansion of existing airspace.

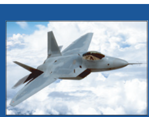
2. The Air Force published a notice of EA preparation in the Fairbanks Daily News-Miner on October 8, 2005 and the Anchorage Daily News on October 9, 2005. These early notices supported community outreach at the Alaskan Federation of Natives Conference, October 20 to 22 and a community outreach scoping meeting in Anchorage, October 24.

3. Pursuant to analysis of the proposed beddown and to support compliance with the Endangered Species Act, we would like to request information regarding federally listed threatened, endangered, candidate, and proposed to be listed species that occur or may occur in the potentially affected area. Please send this information to our representative at: SAIC Attn: Ms. Christa Stumpf, 405 S. 8th St., Ste. 301, Boise, ID 83702. We would appreciate your identifying a point of contact for any follow-up questions we may have. Please provide any preliminary agency comments or information regarding the proposed beddown not later than 15 January 2005 in order to be incorporated in the preparation of the draft EA.

4. If you have any specific questions about the proposal, we would like to hear from you. The primary point of contact is Ms. Ellen Godden, (907) 552-7305 and an alternate point of contact is Mr. Gregory Schmidt, (907) 552-1609. Thank you for your assistance in this matter.

MICHAEL R. HASS, Colonel, USAF
Commander

Attachments:
1. Scoping Meeting Handout
2. Elmendorf AFB Map
3. Elmendorf Military Operations Areas Map



F/A-22

Elmendorf Air Force Base
F/A-22 Operational Wing Beddown EA

The Proposal:

Elmendorf Air Force Base (AFB), Alaska will prepare an Environmental Assessment (EA) to analyze the potential environmental consequences of a proposal to beddown the nation's second operational wing of F/A-22 aircraft at Elmendorf AFB.

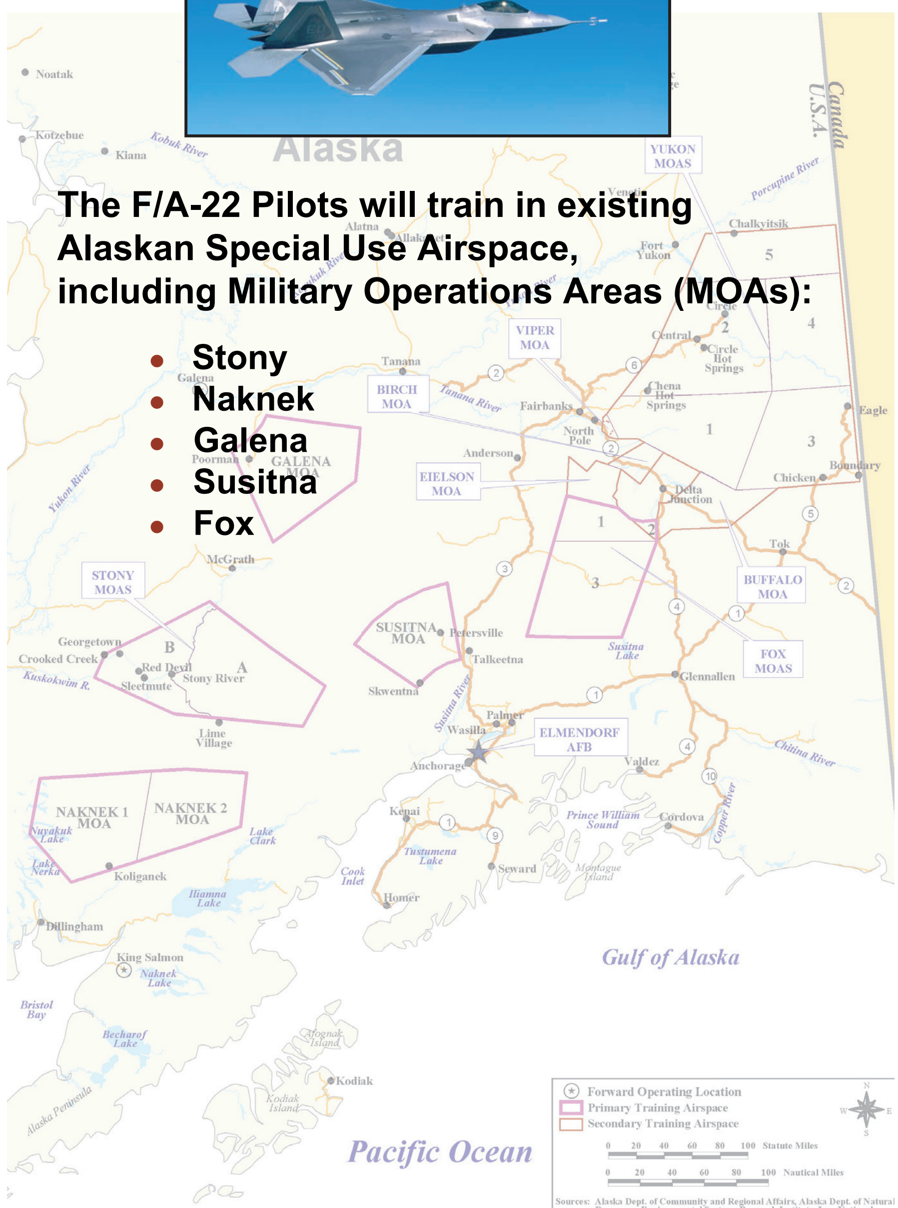
The Proposal includes changes to:

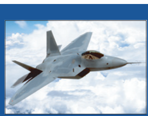
- **Aircraft**
  - Beddown of two F/A-22 aircraft squadrons (48 operational aircraft).
  - One existing F-15C squadron and one F-15E squadron depart for relocation.
  - One F-15C squadron will remain.
- **Manpower**
  - Changes in personnel to support beddown.
- **Military Facilities**
  - Construction of 20 new or upgraded facilities on Elmendorf AFB.
  - Disturbance to about 50 acres for facility construction.

Proposed Military Construction at Elmendorf
- Operations/Maintenance Facilities/Hangars
- Low-Observable Restoration
- Flight Simulator Facility
- Base Communication Infrastructure
- Other Base Support Facility Upgrades

The F/A-22 Pilots will train in existing Alaskan Special Use Airspace, including Military Operations Areas (MOAs):

- **Stony**
- **Naknek**
- **Galena**
- **Susitna**
- **Fox**





F/A-22

Elmendorf Air Force Base

F/A-22 Operational Wing Beddown EA

The Environmental Process:

The National Environmental Policy Act (NEPA) guides the Environmental Assessment.

The Draft Environmental Assessment (EA) analyzes the following resources to determine potential environmental consequences associated with beddown of the F/A-22 Operational Wing at Elmendorf AFB.

- **Airspace Operations**
  Airspace, Noise, Air Quality, and Safety (ground and air)
- **Natural Resources**
  Geology, Soils, Water, and Biological Resources
- **Cultural Resources**
  Cultural, Native Alaskan, and Visual Resources
- **Human Resources**
  Land Use, Socioeconomics, and Environmental Justice
- **Community Infrastructure**
  Public Services, Transportation, Hazardous Materials and Waste

The EA Process

Opportunities for Public Involvement

Where Are We Now?

Notice of Intent to Prepare EA Published in Newspapers

↓

Community Outreach/Scoping

↓

Refine Proposed Action

↓

Preparation of Draft EA

↓

Notice of Availability of Draft EA

↓

Public and Agency Comment Period

↓

Preparation of Final EA

↓

Notice of Availability of Final EA

Your comments will be used to help shape and refine the proposal and will guide the enviromental analysis. Persons wishing to mail comments should mail them before November 19,2005 to the address below, in order to be considered in the Draft EA.

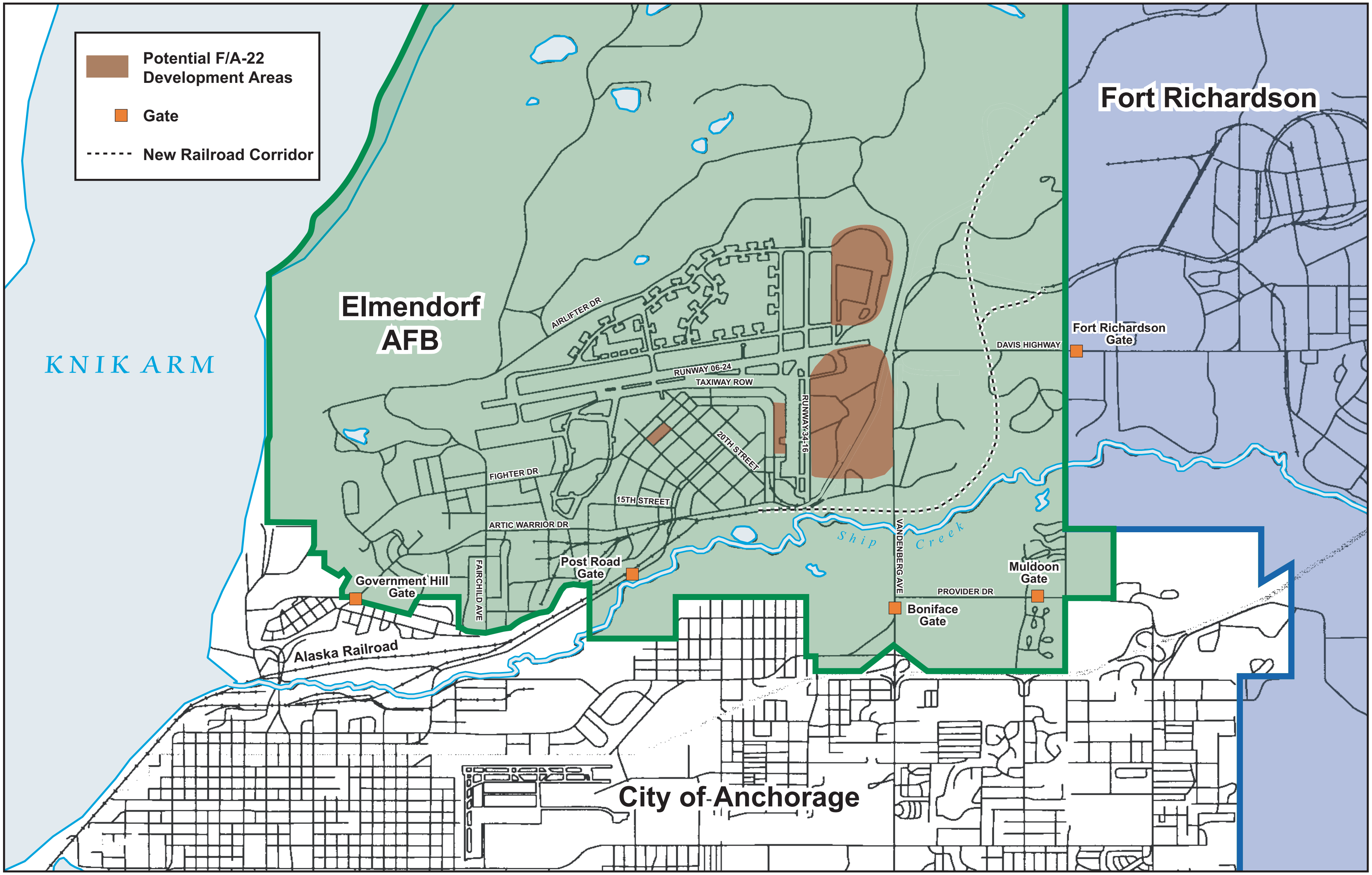
Your involvement and input are essential to the environmental process.

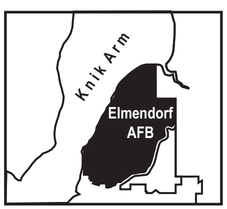
Send written comments to:
Capt. Kelley Jeter
3 WG/PA
10480 22nd Street
Elmendorf AFB, AK 99506

For general information, contact:
Elmendorf AFB Public Affairs
Capt. Kelley Jeter
(907) 552-5756

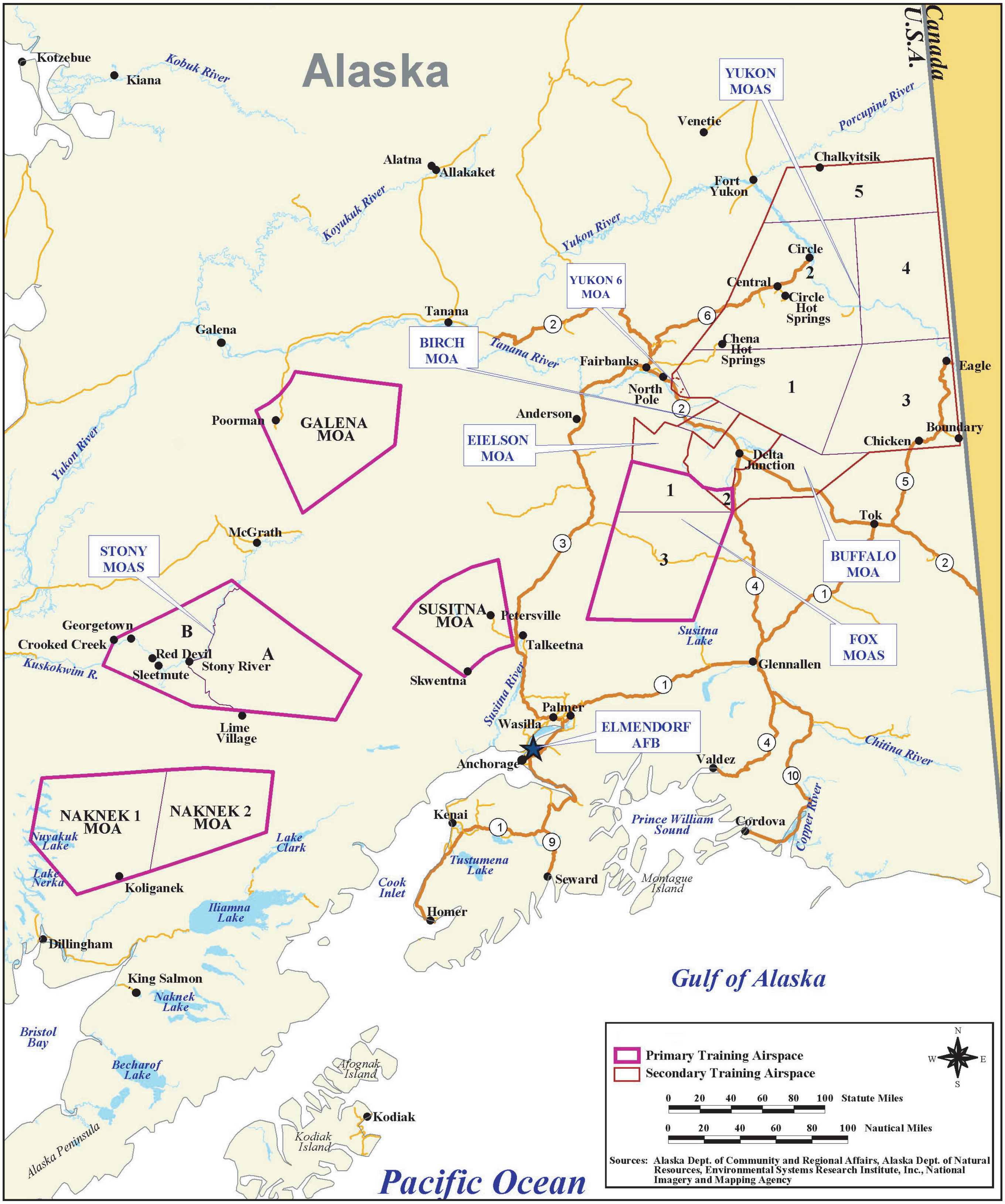
Community Outreach Events

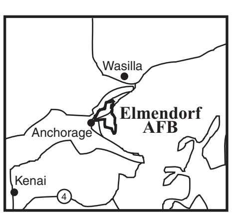
- **October 20 to 22, 2005, daily.** Visit the F/A-22 booth at the **Alaskan Federation of Natives Conference**, Carlson Center, 2010 2nd Avenue, Fairbanks, AK.
- **October 24, 2005, 4:00 - 7:00 p.m.** Attend a public meeting at the **Hilton Garden Inn Anchorage**, 100 W. Tudor Road, Anchorage, AK.





Elmendorf Air Force Base (AFB)
Attachment 2





Elmendorf Military Operations Areas (MOAs)
Attachment 3

DEPARTMENT OF THE AIR FORCE
PACIFIC AIR FORCES

12 December 2005

MEMORANDUM FOR SEE DISTRIBUTION

FROM: 3 CES/CC
6326 Arctic Warrior Drive
Elmendorf AFB AK 99506-3240

SUBJECT: F/A-22 Beddown Environmental Assessment

1. The United States Air Force is preparing an Environmental Assessment (EA) to assess the potential environmental consequences of a proposal to locate, or "bed down," approximately 48 operational F/A-22 aircraft at Elmendorf AFB (refer to attachment 1). One existing F-15C squadron and one existing F-15E squadron would be relocated from Elmendorf AFB concurrently with the proposed two-squadron F/A-22 beddown. The EA will address changes in personnel, alternative locations, numbers of facilities to support the proposed beddown (refer to attachment 2), and a No Action alternative. F/A-22 training is proposed for existing airspace and ranges utilized by the F-15C and F-15E aircraft (refer to attachment 3). None of the alternatives under consideration would require expansion of existing airspace.

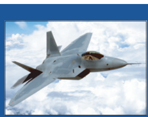
2. The Air Force published a notice of EA preparation in the Fairbanks Daily News-Miner on October 8, 2005 and the Anchorage Daily News on October 9, 2005. These early notices supported community outreach at the Alaskan Federation of Natives Conference, October 20 to 22, and a community outreach scoping meeting in Anchorage, October 24.

3. In an effort to analyze the potential effects of this proposed beddown the Air Force or its contractor, SAIC, may be contacting you in their data collection efforts. Please notify us of any concerns you desire be addressed in the proposed EA not later than January 6th, 2006 in order to be incorporated in the preparation of the draft EA. We thank you in advance for your assistance in this activity.

4. If you have any specific questions about the proposal, we would like to hear from you. The primary point of contact is Ms. Ellen Godden, (907) 552-7305 and an alternate point of contact is Mr. Gregory Schmidt, (907) 552-1609. Thank you for your assistance in this matter.

MICHAEL R. HASS, Colonel, USAF
Commander

Attachments:
1. Scoping Handout
2. Elmendorf AFB Map
3. Elmendorf Military Operations Areas Map
4. Distribution List



F/A-22

Elmendorf Air Force Base
F/A-22 Operational Wing Beddown EA

The Proposal:

Elmendorf Air Force Base (AFB), Alaska will prepare an Environmental Assessment (EA) to analyze the potential environmental consequences of a proposal to beddown the nation's second operational wing of F/A-22 aircraft at Elmendorf AFB.

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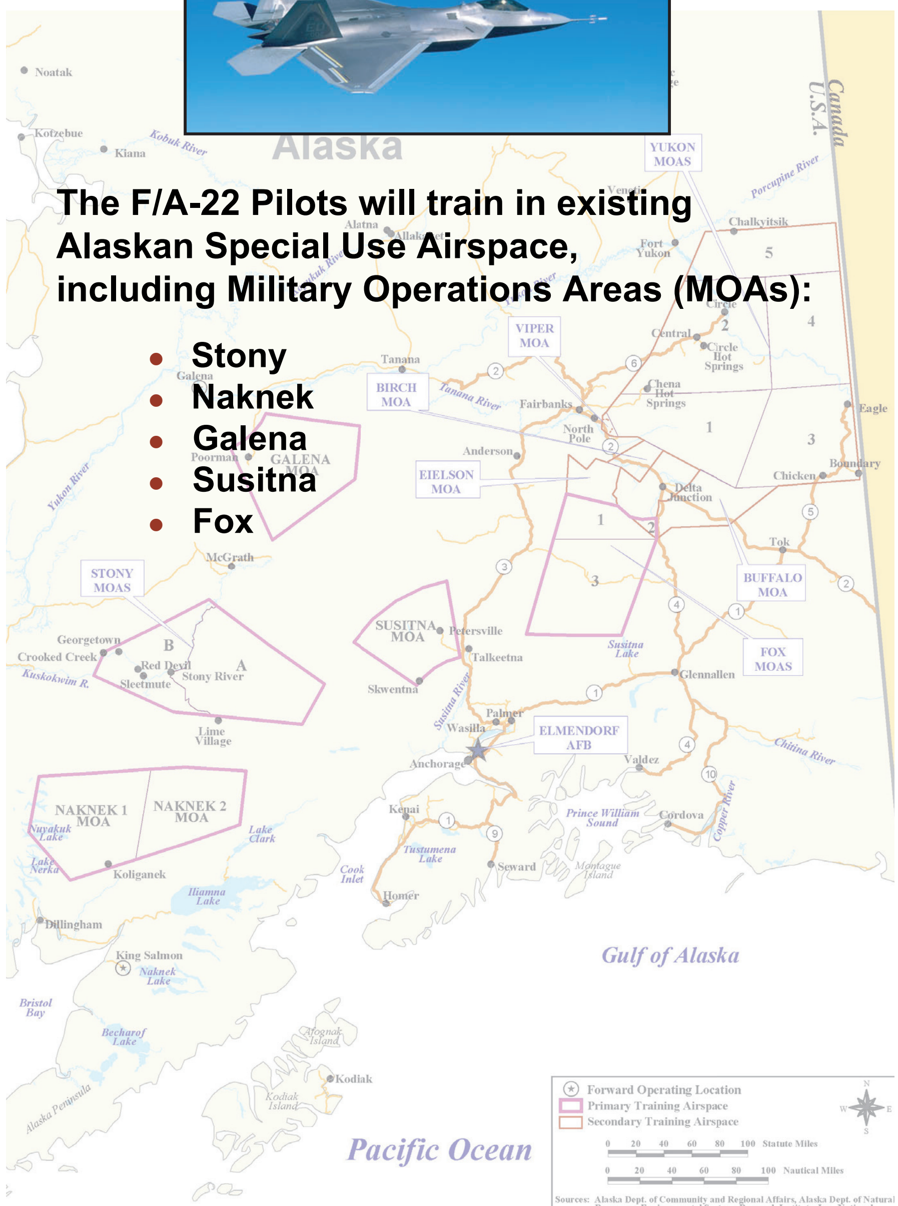

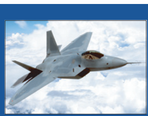

F/A-22

Elmendorf Air Force Base
F/A-22 Operational Wing Beddown EA

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- **Airspace Operations**
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Your involvement and input are essential to the environmental process.

Send written comments to:
Capt. Kelley Jeter
3 WG/PA
10480 22nd Street
Elmendorf AFB, AK 99506

For general information, contact:
Elmendorf AFB Public Affairs
Capt. Kelley Jeter
(907) 552-5756

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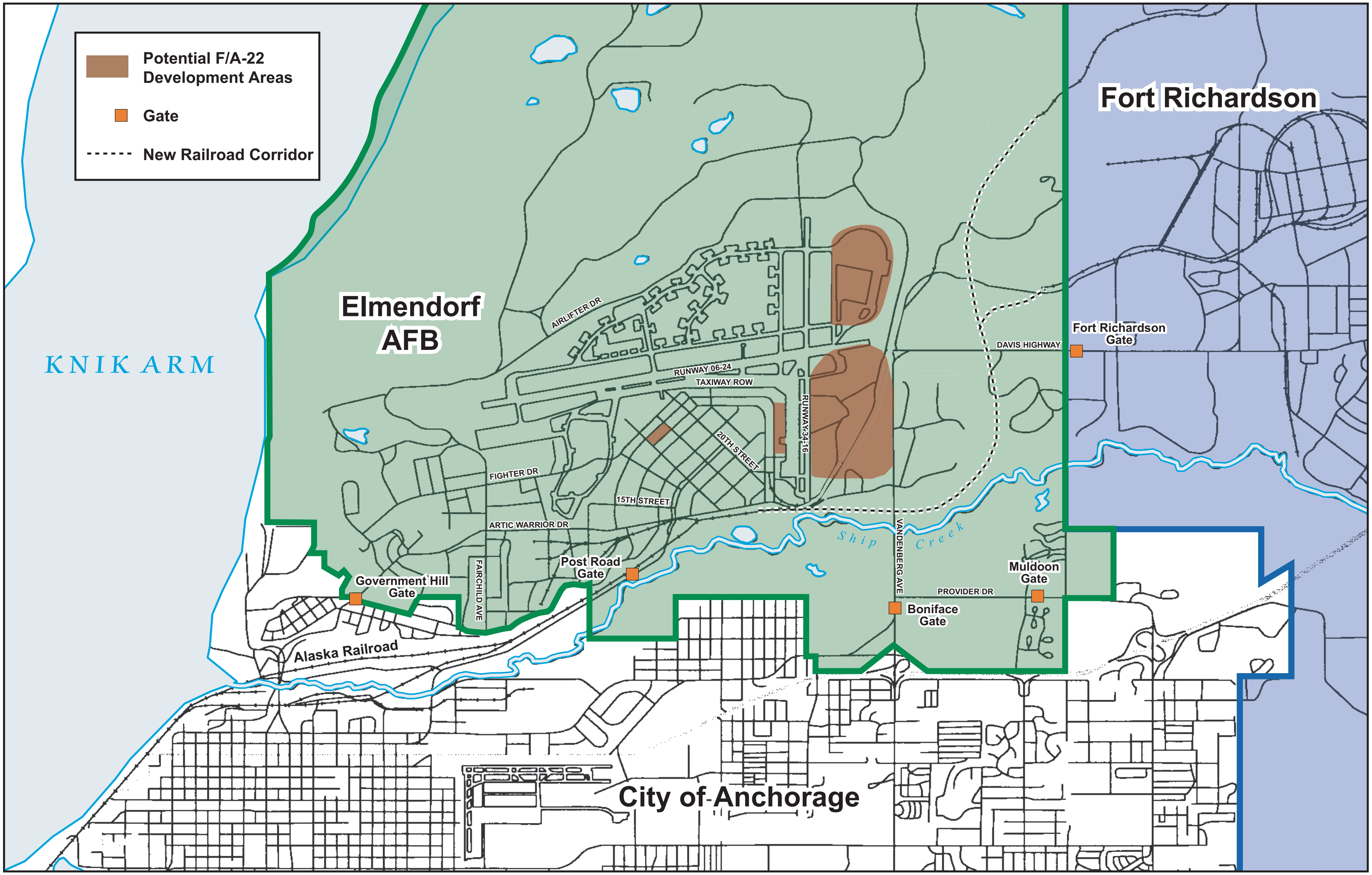
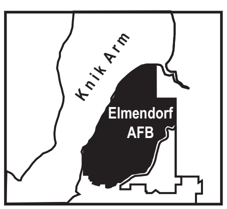
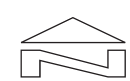
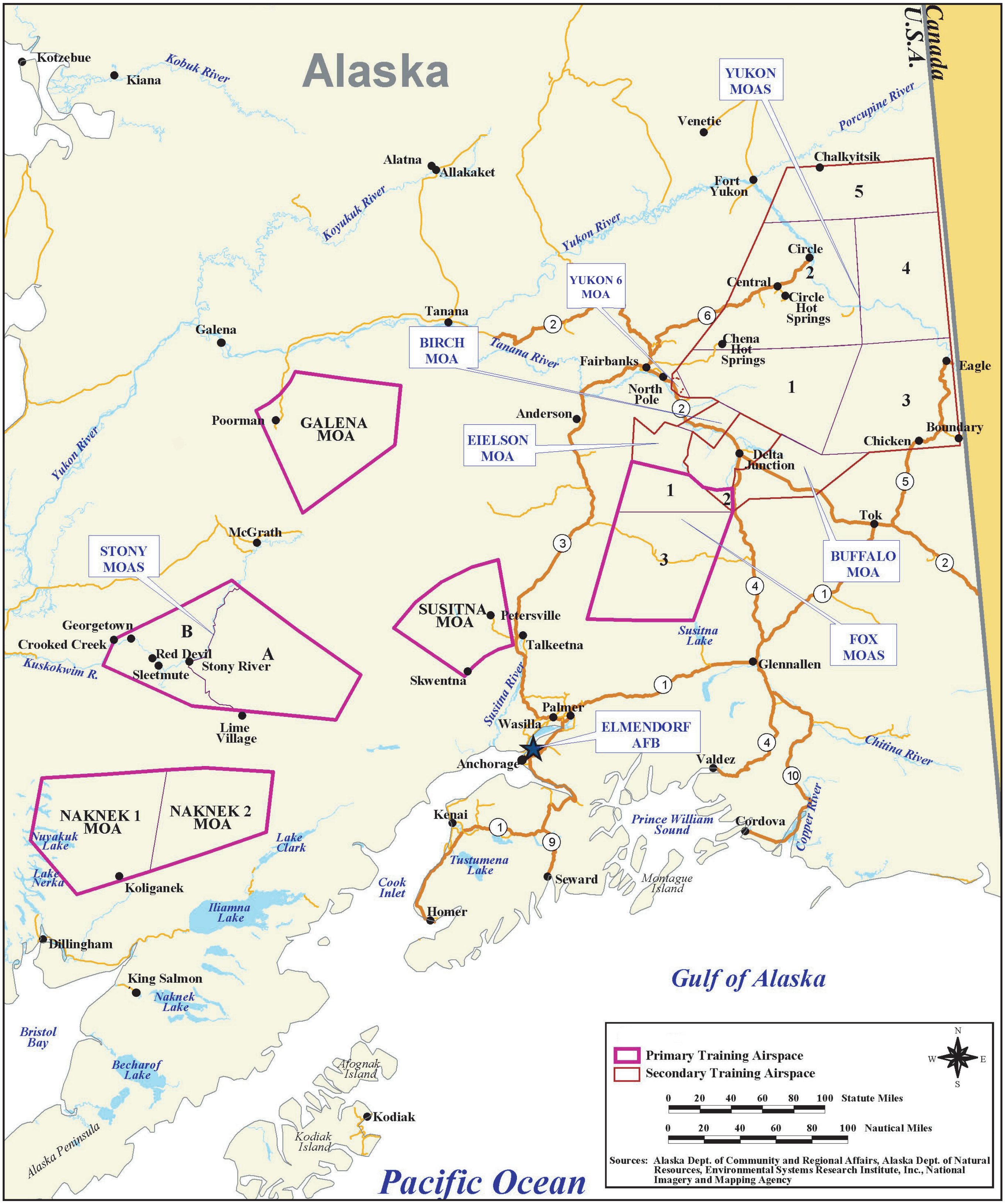
  Attend a public meeting at the **Hilton Garden Inn Anchorage**, 100 W. Tudor Road, Anchorage, AK.

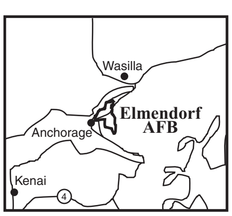




Elmendorf Air Force Base (AFB)
Attachment 2







Elmendorf Military Operations Areas (MOAs)
Attachment 3

F/A-22 Environmental Assessment
Memorandum Distribution List

1. U.S. Environmental Protection Agency
   ATTN: Marcia Combes
   222 W. 7th Ave., #19
   Anchorage, AK 99513-7588

2. U.S. Army Corps of Engineers
   Project Management Division
   ATTN: Stephen Boardman
   P.O. Box 6898
   Elmendorf AFB, AK 99506

3. U.S. Department of Interior
   Office of Environmental Policy
   1689 C Street, Room 119
   Anchorage, AK 99501

4. National Park Service
   ATTN: Marcia Blaszak
   2525 Gambell Street, Room 107
   Anchorage, AK 99503

5. U.S. Army Alaska
   ATTN: APVR-RPW
   730 Quartermaster Rd., #6500
   Ft. Richardson, AK 99505-6500

6. U.S. Army Alaska
   Directorate of Public Works
   ATTN: Kevin Gardner
   730 Quartermaster Road
   Ft. Richardson, AK 99505

7. Navy/Military Sealift Command
   ATTN: Ron Kahlenbeck
   31270 Acacia Dr.
   Elmendorf AFB, AK 99506

8. U.S. Coast Guard
   Marine Safety Office
   510 L St., Suite 100
   Anchorage, AK 99501-1946

9. U.S. Department of Transportation
   Federal Aviation Administration
   ATTN: Patrick Poe
   222 W. 7th Ave.
   Anchorage, AK 99513

10. U.S. Department of Transportation
    Federal Highway Administration
    117 W. 4th Ave.
    Anchorage, AK 99501

11. U.S. Department of Transportation
    Region 10 Federal Transit Administration
    915 Second Ave., Ste. 3142
    Anchorage, AK 99513

12. U.S. Department of Transportation
    Maritime Administration
    ATTN: Michael Carter
    400 7th St. SW, Rm. 7310
    MAR-800
    Washington, DC 20590

13. U.S. Department of Transportation
    Maritime Administration
    ATTN: Lyn McClelland
    915 2nd Ave., Room 3196
    Seattle, WA 98174

14. U.S. Department of Transportation
    Team Northwest
    ATTN: Alan Collinge
    708 Broadway, #110
    Tacoma, WA 98402

15. U.S. Department of Interior
    Bureau of Indian Affairs
    ATTN: Niles Caesar
    222 W. 7th Ave., #13
    Anchorage, AK 99501

16. Bureau of Land Management
    Anchorage District Field Office
    ATTN: Clinton Hanson
    6881 Abbott Loop Rd.
    Anchorage, AK 99507

17. National Marine Fisheries Service
    ATTN: Brian Lance
    222 W. 7th Ave., Room 517
    Anchorage, AK 99513

18. U.S. Department of Agriculture
    NRCS
    949 E. 36th Ave., Suite 400
    Anchorage, AK 99508

19. U.S. Department of Commerce
    ATTN: Jeanne Hanson
    222 W. 7th Ave., #13
    Anchorage, AK 99513

20. Alaska Federation of Natives
    ATTN: Julie Kitka
    1577 C St., Suite 300
    Anchorage, AK 99501

21. State of Alaska
    Division of Governmental Coordination
    ATTN: Sue Magee
    550 W. 7th Ave., Suite 1660
    Anchorage, AK 99501

22. State of Alaska
    Department of Military and Veteran Affairs
    ATTN: Mr. Craig E. Campbell, Major General
    P.O. Box 5800 Camp Denali
    Ft. Richardson, AK 99505-5800

23. State of Alaska
    Department of Natural Resources
    ATTN: Michael Menge
    550 W. 7th St., Ste. 500
    Anchorage, AK 99501-3561

24. State of Alaska
    Department of Transportation
    Central Region Office
    ATTN: Dave Eberle
    4111 Aviation Avenue
    Anchorage, AK 99519

25. Port of Anchorage
    ATTN: Mr. William Sheffield
    2000 Anchorage Port Road
    Anchorage, AK 99501

26. Municipality of Anchorage
    Anchorage Municipal Assembly
    Municipal Clerk's Office
    ATTN: Anna Fairclough
    632 W. 6th Ave., Ste. 160
    Anchorage, AK 99501

27. Municipality of Anchorage
    Department of Community Planning and
    Development
    P.O. Box 196650
    Anchorage, AK 99519

28. Anchorage School District
    ATTN: Carol Comeau
    4600 DeBarr Road
    P.O. Box 6614
    Anchorage, AK 99508-6614

29. Matanuska-Susitna Borough
    ATTN: Marc Van Dongen
    350 East Dahlia Avenue
    Palmer, AK 99645

30. State of Alaska
    Department of Environmental Conservation
    ATTN: Jim Freechione
    555 Cordova Street
    Anchorage, AK 99501

31. State of Alaska
    Department of Fish and Game
    Division of Wildlife Conservation
    ATTN: Grant Hilderbrand
    333 Raspberry Road
    Anchorage, AK 99515

32. Alaska Railroad Corporation
    ATTN: Mr. Patrick Gamble
    P.O. Box 107500
    Anchorage, AK 99510-7500

33. Municipality of Anchorage
    ATTN: Mary Jane Michaels
    P.O. Box 196650
    Anchorage, AK 99519-6650

DEPARTMENT OF THE AIR FORCE
PACIFIC AIR FORCES

DEC 21 2005

MEMORANDUM FOR SEE DISTRIBUTION

FROM: 3 CES/CC
6326 Arctic Warrior Drive
Elmendorf AFB AK 99506-3240

SUBJECT: F-22 Beddown Environmental Assessment

1. The United States Air Force (Air Force) is preparing an Environmental Assessment (EA) to assess the potential environmental consequences of a proposal to locate, or "beddown," 48 F-22 aircraft at Elmendorf AFB (refer to attachment 1). One existing F-15C squadron and one existing F-15E squadron would be relocated from Elmendorf AFB concurrently with the proposed two-squadron F-22 beddown. The EA will address changes in personnel, alternative locations, and numbers of facilities to support the proposed beddown (refer to attachment 2); as well as a No Action alternative that does not beddown F-22 aircraft at Elmendorf AFB. F-22 training is proposed for existing airspace and ranges utilized by the F-15C and F-15E aircraft (refer to attachment 3). None of the alternatives under consideration would require expansion of existing airspace.

2. The Air Force published a notice of EA preparation in the Fairbanks Daily News-Miner on October 8, 2005 and the Anchorage Daily News on October 9, 2005. These early notices supported community outreach at the Alaskan Federation of Natives Conference, October 20 to 22 and a community outreach scoping meeting in Anchorage on October 24.

3. As part of this EA process, the Air Force would like to respond to any questions or concerns you may have regarding the proposed beddown. In order to give specific concerns consideration early in the development of this EA, I would appreciate your sending them to the above address, attention of Ms. Ellen Godden by January 15, 2006. If you have any questions or comments about this proposal, please contact Captain Kelley Jeter, Public Affairs, at (907) 552-5756, or Ellen Godden, Environmental Planner, at 552-7305.

MICHAEL R. HASS, Colonel, USAF
Commander

Attachments:
1. Scoping Handout
2. Elmendorf AFB Map
3. Elmendorf Military Operations Areas Map
4. Distribution List

DISTRIBUTION LIST

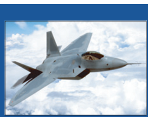
Northeast Community Council
ATTN: Mr Bob Roses, Chair
8200 E 2nd Ave
Anchorage AK 99504

Anchorage Assembly
ATTN: Ken Stout
P.O. Box 196650
Anchorage AK 99519-6650

Government Hill Community Council
ATTN: Stephanie Kesler
P.O. Box 100018
Anchorage AK 99510-0018

Mountain View Community Council
ATTN: Mr. Hugh Wade
733 N. Flower Street
Anchorage AK 99508

Fairview Community Council
ATTN: Mr. Darrell Hess
328 E 15th Av #1
Anchorage AK 99501



F/A-22

Elmendorf Air Force Base

F/A-22 Operational Wing Beddown EA

The Proposal:

Elmendorf Air Force Base (AFB), Alaska will prepare an Environmental Assessment (EA) to analyze the potential environmental consequences of a proposal to beddown the nation's second operational wing of F/A-22 aircraft at Elmendorf AFB.

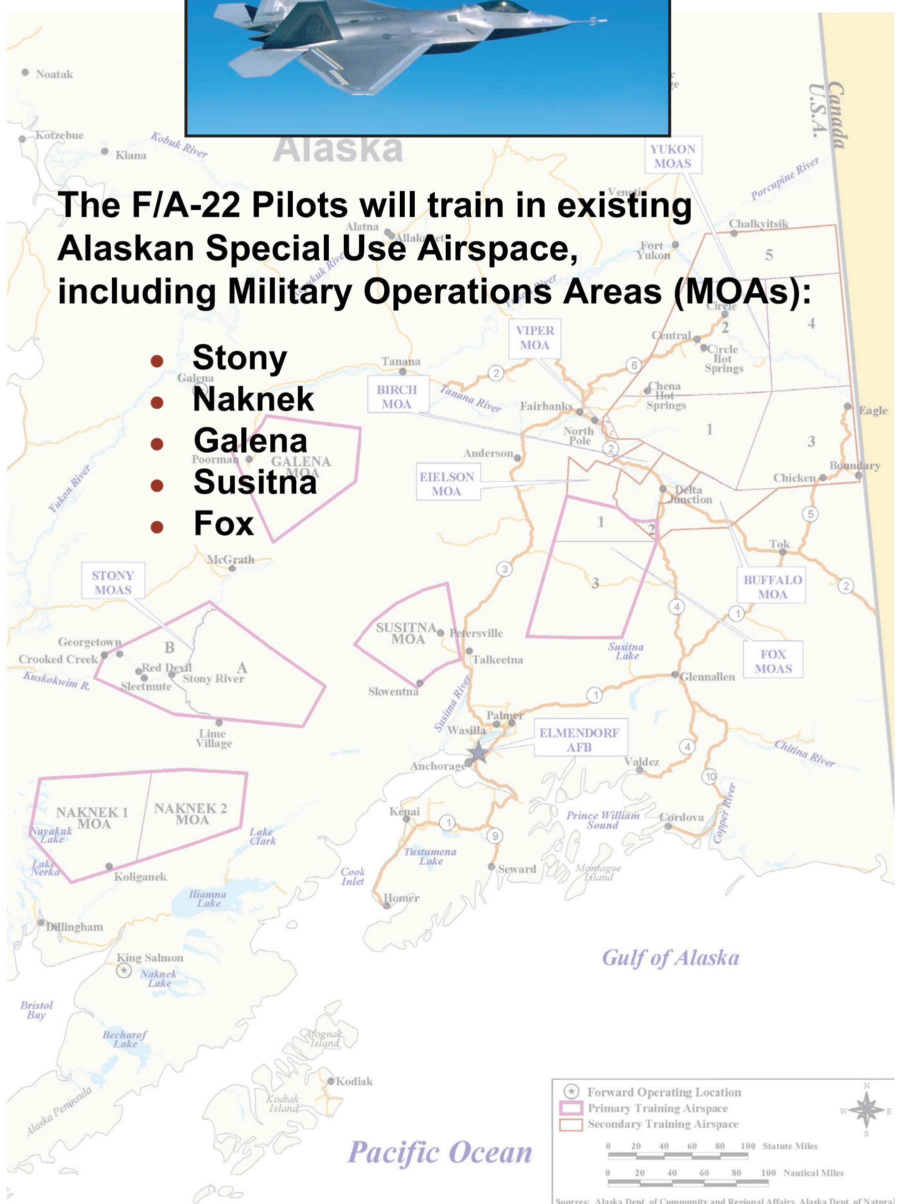
The Proposal includes changes to:

- **Aircraft**
  - Beddown of two F/A-22 aircraft squadrons (48 operational aircraft).
  - One existing F-15C squadron and one F-15E squadron depart for relocation.
  - One F-15C squadron will remain.
- **Manpower**
  - Changes in personnel to support beddown.
- **Military Facilities**
  - Construction of 20 new or upgraded facilities on Elmendorf AFB.
  - Disturbance to about 50 acres for facility construction.

Proposed Military Construction at Elmendorf
- Operations/Maintenance Facilities/Hangars
- Low-Observable Restoration
- Flight Simulator Facility
- Base Communication Infrastructure
- Other Base Support Facility Upgrades

The F/A-22 Pilots will train in existing Alaskan Special Use Airspace, including Military Operations Areas (MOAs):

- **Stony**
- **Naknek**
- **Galena**
- **Susitna**
- **Fox**



F/A-22

Elmendorf Air Force Base
F/A-22 Operational Wing Beddown EA

The Environmental Process:

The National Environmental Policy Act (NEPA) guides the Environmental Assessment.

The Draft Environmental Assessment (EA) analyzes the following resources to determine potential environmental consequences associated with beddown of the F/A-22 Operational Wing at Elmendorf AFB.

- **Airspace Operations**
  Airspace, Noise, Air Quality, and Safety (ground and air)
- **Natural Resources**
  Geology, Soils, Water, and Biological Resources
- **Cultural Resources**
  Cultural, Native Alaskan, and Visual Resources
- **Human Resources**
  Land Use, Socioeconomics, and Environmental Justice
- **Community Infrastructure**
  Public Services, Transportation, Hazardous Materials and Waste

Your comments will be used to help shape and refine the proposal and will guide the enviromental analysis. Persons wishing to mail comments should mail them before November 19,2005 to the address below, in order to be considered in the Draft EA.

Send written comments to:
Capt. Kelley Jeter
3 WG/PA
10480 22nd Street
Elmendorf AFB, AK 99506

For general information, contact:
Elmendorf AFB Public Affairs
Capt. Kelley Jeter
(907) 552-5756

The EA Process

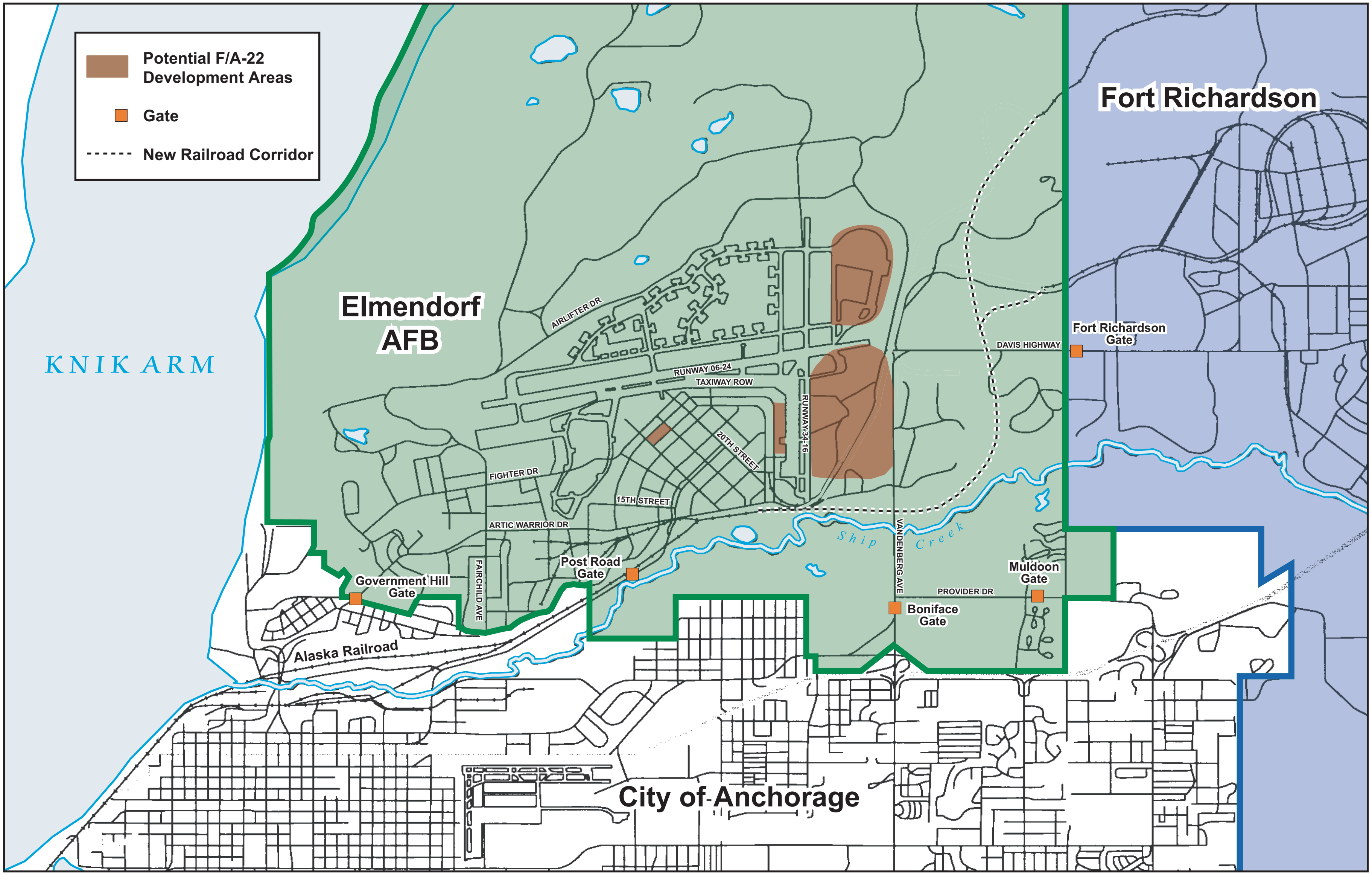
Opportunities for Public Involvement
Where Are We Now?

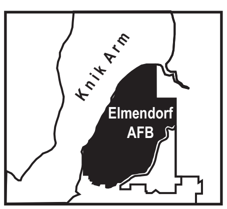
- Notice of Intent to Prepare EA Published in Newspapers
- Community Outreach/Scoping
- Refine Proposed Action
- Preparation of Draft EA
- Notice of Availability of Draft EA
- Public and Agency Comment Period
- Preparation of Final EA
- Notice of Availability of Final EA

Your involvement and input are essential to the environmental process.

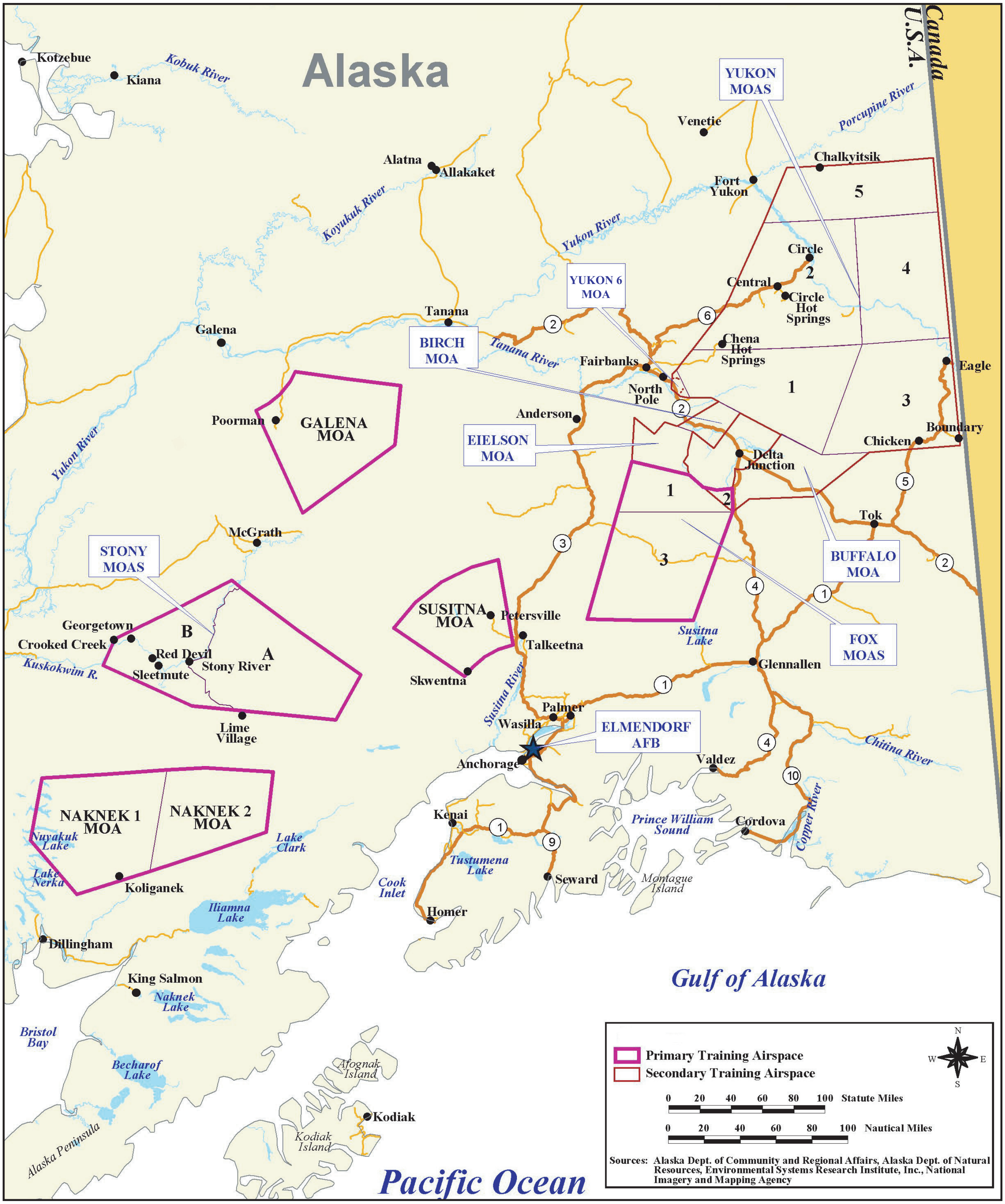
Community Outreach Events

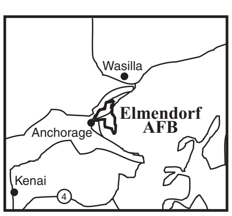
- **October 20 to 22, 2005, daily.** Visit the F/A-22 booth at the **Alaskan Federation of Natives Conference**, Carlson Center, 2010 2nd Avenue, Fairbanks, AK.
- **October 24, 2005, 4:00 - 7:00 p.m.** Attend a public meeting at the **Hilton Garden Inn Anchorage**, 100 W. Tudor Road, Anchorage, AK.





Elmendorf Air Force Base (AFB)
Attachment 2





Elmendorf Military Operations Areas (MOAs)
Attachment 3

DEPARTMENT OF THE AIR FORCE
PACIFIC AIR FORCES

MEMORANDUM FOR DISTRIBUTION

29 Dec 05

FROM: 3 MSG/CC
11550 Heritage Circle
Elmendorf AFB AK 99506-2830

SUBJECT: F-22 Beddown Environmental Assessment

1. The United States Air Force is preparing an Environmental Assessment (EA) to assess the potential environmental consequences of a proposal to locate, or "beddown," 48 F-22 fighter aircraft at Elmendorf Air Force Base (refer to attachment 1). Many of the older F-15 fighter aircraft that are based there now will be relocated.

2. The EA will address proposed changes in personnel, alternative locations and numbers of facilities to support this beddown (refer to attachment 2). The training routes will use the same airspace that is utilized at this time. The Air Force already plans to include an analysis of the F-22's noise level as a part of the Environmental Assessment. None of the alternatives under consideration would require expansion of existing airspace.

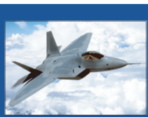
3. Please return the enclosed postcard by January 15, 2006, to let us know you have received this notification and let us know if you have any general concerns that could be addressed in the upcoming EA. If you believe this proposal will significantly affect any tribal right or protected tribal resource, we invite you to consult with us on a government-to-government basis. Write to us and tell us which tribal rights or protected tribal resources will be affected and how they will be significantly affected. If you would like to consult with us, we can be available in early February during the Alaska Forum on the Environment, or at other times which may be mutually convenient.

4. In order to give your initial comments or concerns consideration early, I would appreciate receiving a response by January 15, 2006. If you have any questions or comments about this proposal, contact Ms. Ann Lawton, 3rd Wing Native Liaison, at (907) 552-9677, or Ellen Godden, Environmental Planner, at 552-7305.

ROBERT M. DOUGLAS, Colonel, USAF
Commander

Attachments:
1. Scoping Handout
2. Elmendorf AFB Map
3. Elmendorf Military Operations Areas Map
4. Distribution List
5. Postcard

cc:
Dr. Jerome Montague, ALCOM Tribal Liaison



F/A-22

Elmendorf Air Force Base
F/A-22 Operational Wing Beddown EA

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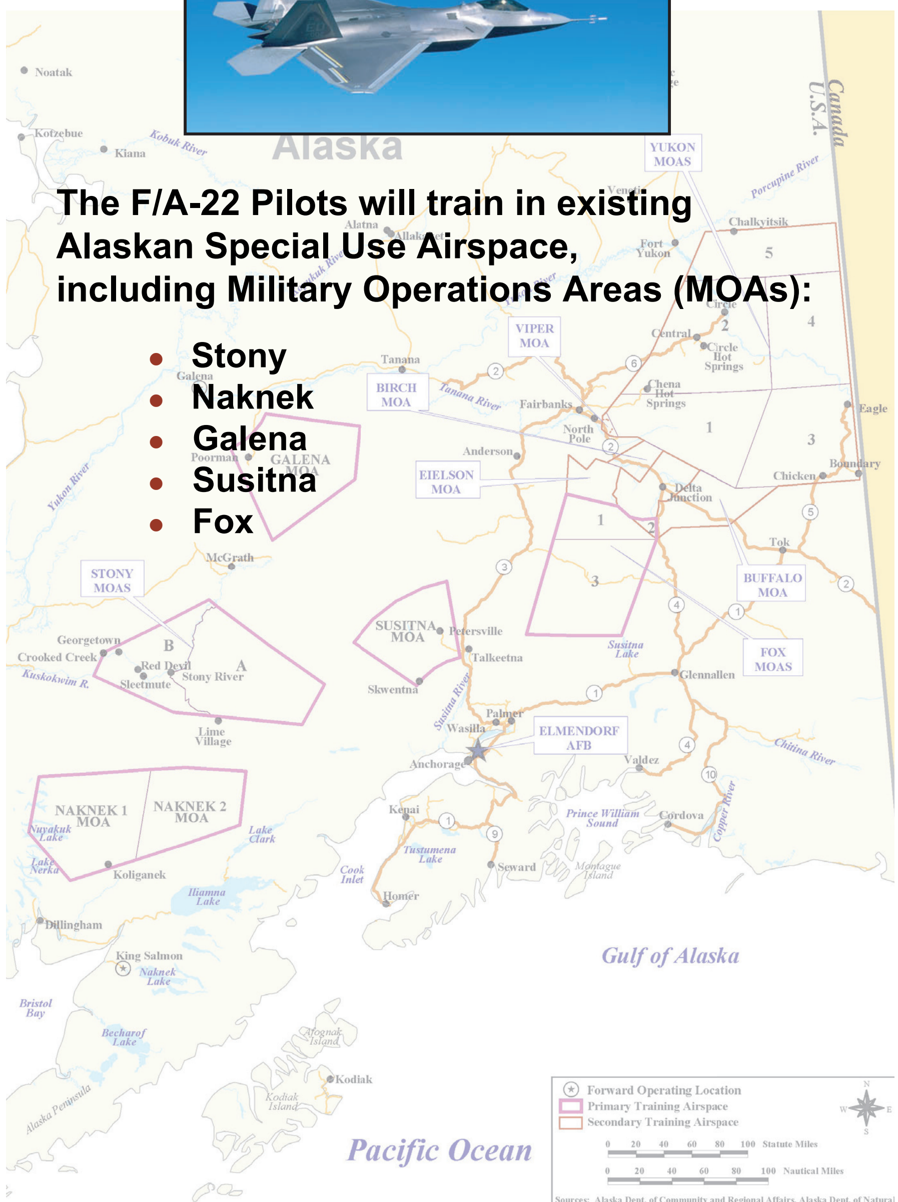

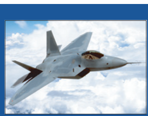

F/A-22

Elmendorf Air Force Base

F/A-22 Operational Wing Beddown EA

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  Cultural, Native Alaskan, and Visual Resources
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Community Outreach/Scoping
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Refine Proposed Action
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↓
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↓
Public and Agency Comment Period
↓
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↓
Notice of Availability of Final EA

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Capt. Kelley Jeter
3 WG/PA
10480 22nd Street
Elmendorf AFB, AK 99506

For general information, contact:
Elmendorf AFB Public Affairs
Capt. Kelley Jeter
(907) 552-5756

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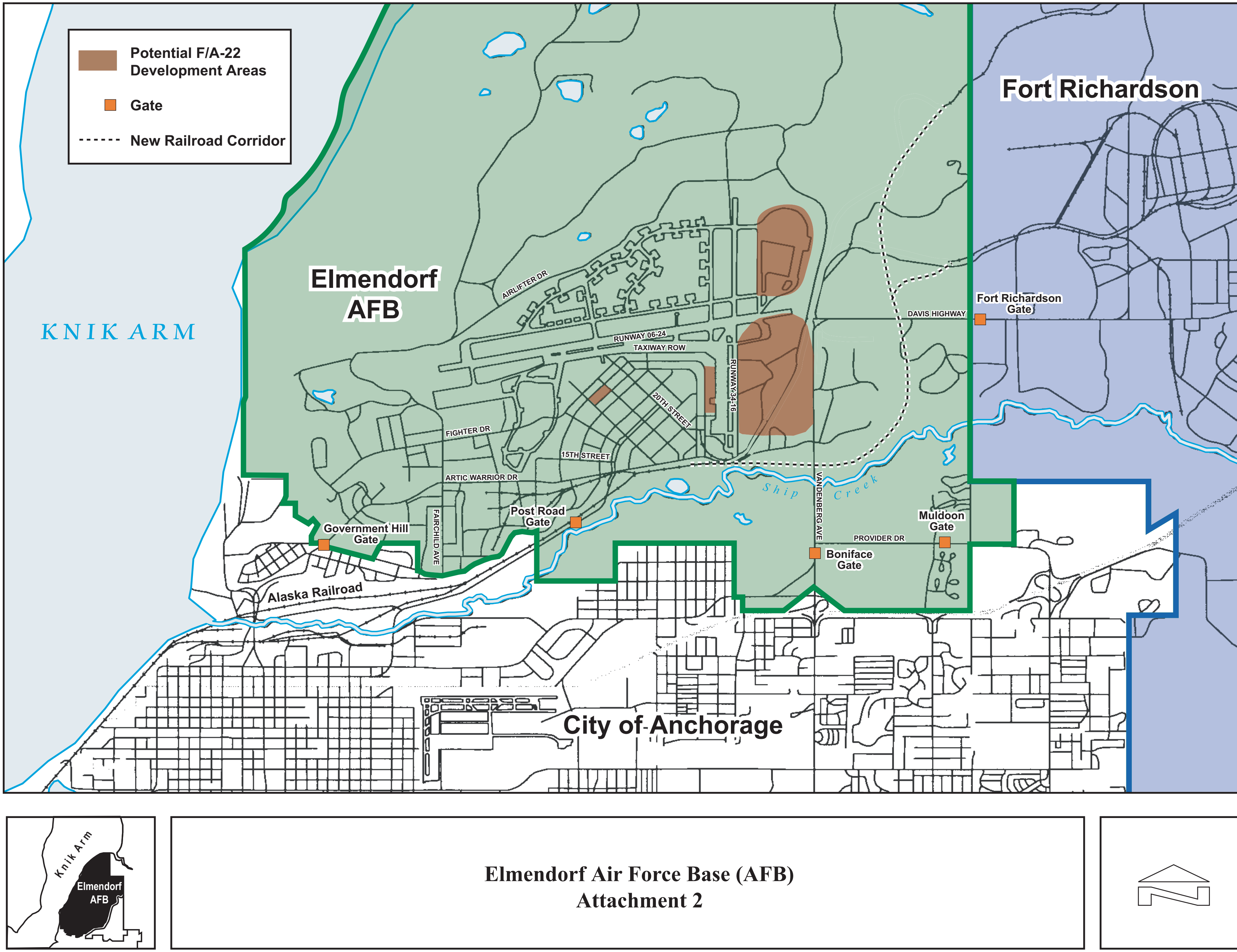
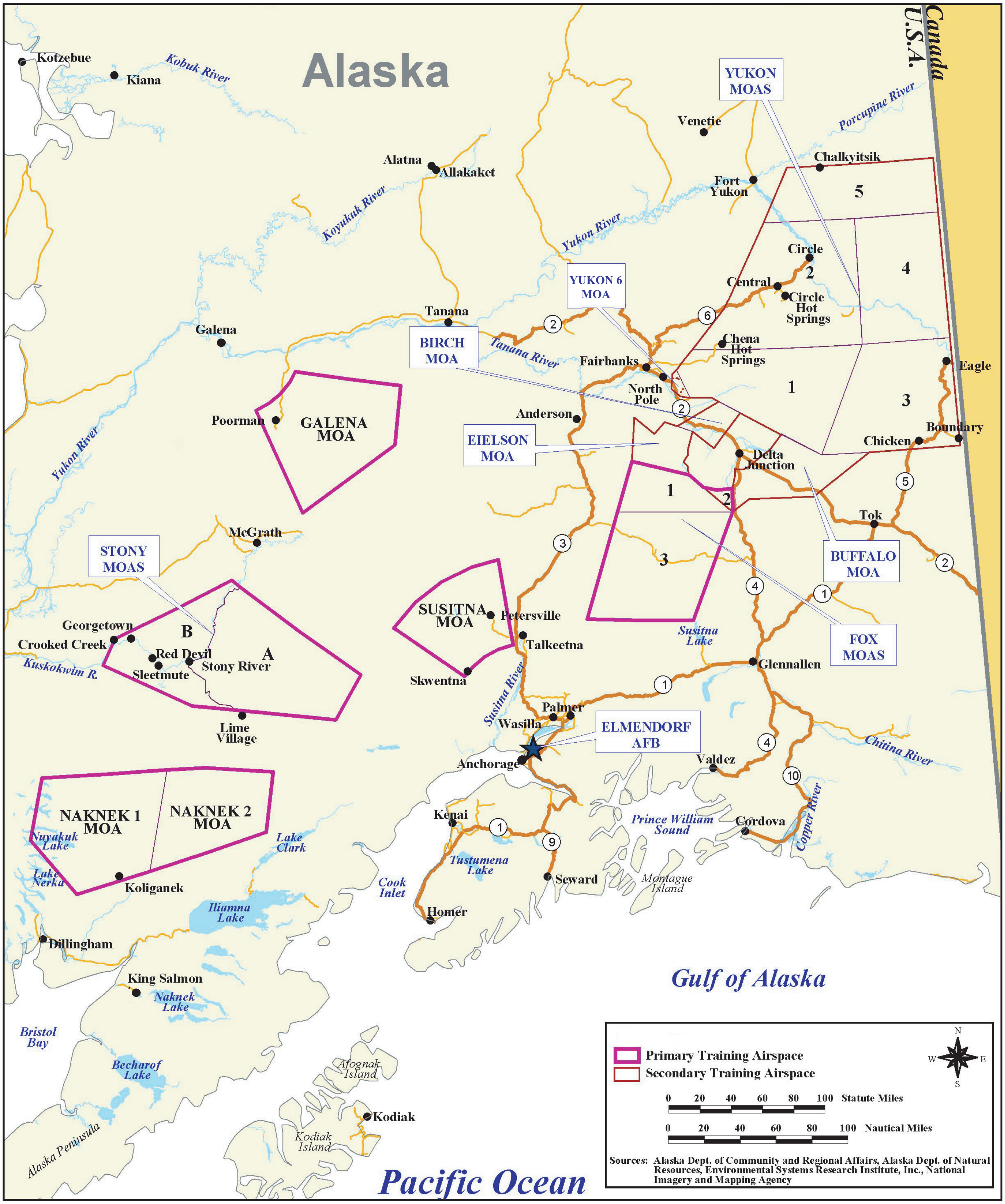
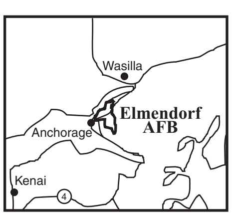


Elmendorf Air Force Base (AFB)
Attachment 2





Elmendorf Military Operations Areas (MOAs)

Attachment 3

F/A-22 Environmental Assessment
Alaska Native Villages
EA Memorandum Distribution List

1. Alaska Federation of Natives
ATTN: Jukie Kitka
1577 C St., Suite 300
Anchorage, AK 99501-5113

2. Native Village of Tyonek (IRA)
ATTN: Carol Burnell
P.O. Box 82009
Tyonek, AK 99682-0009

3. Chalkyitsik Village
ATTN: Paul Edwin
P.O. Box 57
Chalkyitsik, AK 99788-0057

4. Chickaloon Village Traditional Council
ATTN: Gary Harrison
P.O. Box 1105
Chickaloon, AK 99674-1105

5. Circle Native Village Council (IRA)
ATTN: Paul Nathaniel
P.O. Box 89
Circle, AK 99733-0089

6. Dot Lake Village Council
ATTN: William Miller
P.O. Box 2275
Dot Lake, AK 99737-2275

7. Gwichyaa Zhee Gwich'in Tribal Govt.
ATTN: Adlai Alexander
P.O. Box 126
Fort Yukon, AK 99740-0126

8. Igiugig Village Council
ATTN: Michael Andrew, Jr.
P.O. Box 4008
Igiugig, AK 99613-4008

9. King Salmon Village Council
P.O. Box 68
King Salmon, AK 99613-0068

10. Knik Tribal Council
ATTN: Michael Tucker
P.O. Box 871565
Wasilla, AK 99687-1565

11. Kokhanok Village Council
ATTN: Tisha O'Domin
P.O. Box 1007
Kokhanok, AK 99606-1007

12. Lime Village Traditional Council
ATTN: Joe Bobby
P.O. Box LVD
McGrath, AK 99627-8999

13. Louden Village Council
ATTN: Peter Captain, Sr.
P.O. Box 244
Galena, AK 99741-0244

14. Naknek Village Council
ATTN: Steven Angasan
P.O. Box 106
Naknek, AK 99633-0106

15. Native Village of Cantwell
ATTN: Gordon Carlson
P.O. Box 94
Cantwell, AK 99729-0094

16. Eagle Traditional Council
ATTN: David Howard
P.O. Box 19
Eagle, AK 99738-0019

17. Native Village of Eklutna
ATTN: Dorothy Cook
26339 Eklutna Village Road
Chugiak, AK 99567-5148

18. Healy Lake Traditional Council
ATTN: Ben Saylor
P.O. Box 60300
Fairbanks, AK 99706-0300

19. Iliamna Village Council
ATTN: Tim Anelon
P.O. Box 286
Illiamna, AK 99606-0286

20. Venetie Tribal Govt. (IRA)
ATTN: Mary Gamboa
P.O. Box 81080
Venetie, AK 99781-0080

21. Nenana Native Village Association
ATTN: Edna Hancock
P.O. Box 369
Nenana, AK 99760-0369

22. New Koliganek Village Council
ATTN: Herman Nelson, Sr.
P.O. Box 5057
Koliganek, AK 99576-5057

23. Newhalen Tribal Council
ATTN: Raymond Wassillie
P.O. Box 207
Iliamna, AK 99606-0207

24. Nondalton Tribal Council
ATTN: Jack Hobson, Sr.
P.O. Box 49
Nondalton, AK 99640-0049

25. Pedro Bay Village Council
ATTN: Keith Jensen
P.O. Box 47020
Pedro Bay, AK 99647-0020

26. Ruby Tribal Council
ATTN: Donald Honea
P.O. Box 210
Ruby, AK 997680210

27. Sleetmute Traditional Council
    ATTN: Pete Mellick
    P.O. Box 34
    Sleetmute, AK 99668-0034

28. Village of Stony River
    ATTN: Tom Willis
    P.O. Box SRV
    Stony River, AK 99557-8998

29. Tanacross Village Council
    ATTN: Jerry Isaac
    P.O. Box 76009
    Tanacross, AK 99776-6009

30. Native Village of Tanana
    P.O. Box 13
    Tanana, AK 99777-0013

31. Red Devil Traditional Council
    ATTN: Tommy Willis
    P.O. Box 61
    Red Devil, AK 99656-061

EXAMPLE POSTCARD

BACK

F/A-22

F/A-22 Beddown Environmental Assessment (EA)
Elmendorf AFB, AK

☐ We have specific comments on this proposed project and will provide them by **January 15th, 2006.**

☐ We have brief, general comments and these include:

____
____
____

☐ We have no comments on the proposed project at this time, but would like to continue to receive information.

☐ Please correct the contact information and direct future correspondence to:

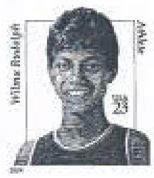
____
____
____

____
Signature Date

If you have any general questions or comments about this proposal, please contact Ann Lawton at (907) 552-9677.

FRONT

Gwichyaa Zhee Gwich'in Tribal Govt.
ATTN: Adlai Alexander
P.O. Box 126
Fort Yukon, AK 99740-0126



3 CES/CEVP
Attention: Ms. Ann Lawton
6326 Arctic Warrior Drive
Elmendorf AFB, AK 99506-2850

STATE OF ALASKA

FRANK H. MURKOWSKI, GOVERNOR

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF PARKS AND OUTDOOR RECREATION
OFFICE OF HISTORY AND ARCHAEOLOGY

550 W. 7TH AVENUE, SUITE 1310
ANCHORAGE, ALASKA 99501-3565
PHONE: (907) 269-8721
FAX: (907) 269-8908

rec 9/26/05

September 16, 2005

File No.: 3130-1R AIR FORCE

Subject: Hangar 16 (Building 15658) (ANC-957)

Michael R. Hass, Colonel, USAF
Commander
Elmendorf Air Force Base
6326 Arctic Warrior Drive
Anchorage, AK 99506

Dear Colonel Hass:

We received your memorandum dated September 9, 2005 regarding the location of the F/A-22 facilities in relation to Hangar 16 (ANC-957). We reviewed this project under section 106 of the National Historic Preservation Act to determine effects to cultural resources. We concur with your finding of No Adverse Effect.

We agree that the new buildings will not significantly alter the view of the historic building. Additionally, the orientation of the new buildings differs from the historic building which demonstrates the evolutionary process of building placement and the distinct periods of construction.

Please contact Doug Gasek (269-8726) if you have any questions or need further assistance.

Sincerely,

Judith Bittner

Judith E. Bittner
State Historic Preservation Officer

JEB:dfg

2006-059

DEPARTMENT OF THE AIR FORCE
PACIFIC AIR FORCES

20 December 2005

MEMORANDUM FOR U.S. Fish and Wildlife Service
ATTN: Ann Rappoport
605 W. 4th Ave., Room G61
Anchorage AK 99501-2250

RECEIVED
DEC 2 2 2005
BY:

FROM: 3 CES/CC
6326 Arctic Warrior Drive
Elmendorf AFB AK 99506-3240

SUBJECT: F-22 Beddown Environmental Assessment

1. The United States Air Force (Air Force) is preparing an Environmental Assessment (EA) to assess the potential environmental consequences of a proposal to locate, or "beddown," 48 operational F-22 aircraft at Elmendorf AFB (refer to attachment 1). One existing F-15C squadron and one existing F-15E squadron would be relocated from Elmendorf AFB concurrently with the proposed two squadron F-22 beddown. The EA will address changes in personnel, alternative locations and numbers of facilities to support the proposed beddown (refer to attachment 2), and a no action alternative that does not beddown F-22 aircraft at Elmendorf AFB. F-22 training is proposed for existing airspace and ranges utilized by the F-15C and F-15E aircraft (refer to attachment 3). None of the alternatives under consideration would require expansion of existing airspace.

2. The Air Force published a notice of EA preparation in the Fairbanks Daily News-Miner on October 8, 2005 and the Anchorage Daily News on October 9, 2005. These early notices supported community outreach at the Alaskan Federation of Natives Conference, October 20 to 22 and a community outreach scoping meeting in Anchorage, October 24.

3. Pursuant to analysis of the proposed beddown and to support compliance with the Endangered Species Act, we would like to request information regarding federally listed threatened, endangered, candidate, and proposed to be listed species that occur or may occur in the potentially affected area. Please send this information to our representative at: SAIC Attn: Ms. Christa Stumpf, 405 S. 8th St., Ste. 301, Boise, ID 83702. We would appreciate your identifying a point of contact for any follow-up questions we may have. Please provide any preliminary agency comments or information regarding the proposed beddown not later than 15 January 2005 in order to be incorporated in the preparation of the draft EA.

4. If you have any specific questions about the proposal, we would like to hear from you. The primary point of contact is Ms. Ellen Godden, (907) 552-7305 and an alternate point of contact is Mr. Gregory Schmidt, (907) 552-1609. Thank you for your assistance in this matter.

MICHAEL R. HASS, Colonel, USAF

Attachments:
1. Scoping Meeting Handout
2. Elmendorf AFB Map
3. Elmendorf Military Operations Areas Map

The U.S. Fish and Wildlife Service (USFWS) has reviewed the plans for this proposed project, relative to Section 7(a)(2) of the Endangered Species Act of 1973, as amended (ESA) (16 U.S.C. 1531 et. seq.). Our records indicate that there are no federally listed or proposed species and/or designated or proposed critical habitat within the action area of the proposed project. Therefore, no further action is required regarding the ESA.

U.S. Fish and Wildlife Service, 605 W. 4th Ave., Rm. G-61, Anchorage, AK 99501
Ph: (907) 271-2888, Fax: (907) 271-2786

FWS Log No. 2006-059

Date 1/5/06

Gregory S. Risdahl
Endangered Species Biologist

-----Original Message-----
From: Donna L. Graham [mailto:Donna.Graham@noaa.gov]
Sent: Thursday, December 22, 2005 8:58 AM
To: Schmidt Gregory J Civ 3 CES/CEV; Brian Lance
Subject: F/A 22 Beddown Environmental Assessment

The National Marine Fisheries Service (NMFS) has reviewed the PCN for applicant USAF, activity fill, F/A 22 Beddown Environmental Assessment. The described action will not result in any adverse effect to Essential Fish Habitat (EFH). No EFH Assessment is required and NMFS does not offer any EFH Conservation Recommendations. Further EFH consultation is not necessary. NMFS has no objection to the project. Please contact Brian Lance at (907) 271-1301 or e-mail brian.lance@noaa.gov if you have questions. Thanks.

sent on 1/23/06

Native Village of Tanacross
Tanacross Village Council

President: Jerry Isaac **Vice President: Roy G. Denny**
Secretary/Treasurer: Dawn W. Jonathan
Council Members: Ray Sanford, Rose Isaac, John Isaac, and Diane Titus
Tanacross Office: (907) 883-5024 **Anchorage Office: (907) 563-1215**

January 17, 2006

3MSG/CC
Robert M. Douglas, Colonel, USAF
11550 Heritage Circle
Elmendorf AFB, AK 99506-2830

RE: F-22 Beddown Environmental Assessment

Dear Colonel Douglas,

I appreciate you contacting us regarding this proposal. I would like to inform you that we do not have specific comments at this time, but we do have general concerns and would like to continue to receive information and remain involved in the process. The general concerns include the following:

1) increased noise from maneuvers in subsistence areas
2) increased disturbance of resources during critical times (breeding, calving etc.), and
3) atmospheric release of jet fuel in the military operations areas.

I will be the primary point contact for NVT regarding this project. However, if I am unavailable, please contact Guy Warren Environmental Director, at (907) 562-0957 if you require immediate assistance. Thank you for your attention to this matter.

Sincerely,

Dawn W. Jonathan

Dawn W. Jonathan, Environmental Program Assistant
(907) 883-5024 ext 110 office
(907) 883-4497 fax
djonathan@nativevillageoftanacross.com

cc: Jerry Isaac, Tribal Administrator
Guy Warren, Environmental Program Director

Appendix D
Aircraft Noise Analysis and Airspace Operations

APPENDIX D AIRCRAFT NOISE ANALYSIS AND AIRSPACE OPERATIONS

Noise is generally described as unwanted sound. Unwanted sound can be based on objective effects (such as hearing loss or damage to structures) or subjective judgments (community annoyance). Noise analysis thus requires a combination of physical measurement of sound, physical and physiological effects, plus psycho- and socio-acoustic effects.

Section 1.0 of this appendix describes how sound is measured and summarizes noise impact in terms of community acceptability and land use compatibility. Section 2.0 gives detailed descriptions of the effects of noise that lead to the impact guidelines presented in section 1. Section 3.0 provides a description of the specific methods used to predict aircraft noise, including a detailed description of sonic booms.

1.0 NOISE DESCRIPTORS AND IMPACT

Aircraft operating in the Military Operations Areas (MOAs) and Warning Areas generate two types of sound. One is "subsonic" noise, which is continuous sound generated by the aircraft's engines and also by air flowing over the aircraft itself. The other is sonic booms (only in MOAs and Warning Areas authorized for supersonic), which are transient impulsive sounds generated during supersonic flight. These are quantified in different ways.

Section 1.1 describes the characteristics which are used to describe sound. Section 1.2 describes the specific noise metrics used for noise impact analysis. Section 1.3 describes how environmental impact and land use compatibility are judged in terms of these quantities.

1.1 Quantifying Sound

Measurement and perception of sound involve two basic physical characteristics: amplitude and frequency. Amplitude is a measure of the strength of the sound and is directly measured in terms of the pressure of a sound wave. Because sound pressure varies in time, various types of pressure averages are usually used. Frequency, commonly perceived as pitch, is the number of times per second the sound causes air molecules to oscillate. Frequency is measured in units of cycles per second, or hertz (Hz).

Amplitude. The loudest sounds the human ear can comfortably hear have acoustic energy one trillion times the acoustic energy of sounds the ear can barely detect. Because of this vast range, attempts to represent sound amplitude by pressure are generally unwieldy. Sound is, therefore, usually represented on a logarithmic scale with a unit called the decibel (dB). Sound on the decibel scale is referred to as a sound level. The threshold of human hearing is approximately 0 dB, and the threshold of discomfort or pain is around 120 dB.

Because of the logarithmic nature of the decibel scale, sounds levels do not add and subtract directly and are somewhat cumbersome to handle mathematically. However, some simple rules of thumb are useful in dealing with sound levels. First, if a sound's intensity is doubled, the sound level increases by 3 dB, regardless of the initial sound level. Thus, for example:

60 dB + 60 dB = 63 dB, and

80 dB + 80 dB = 83 dB.

The total sound level produced by two sounds of different levels is usually only slightly more than the higher of the two. For example:

60.0 dB + 70.0 dB = 70.4 dB.

Because the addition of sound levels behaves differently than that of ordinary numbers, such addition is often referred to as "decibel addition" or "energy addition." The latter term arises from the fact that combination of decibel values consists of first converting each decibel value to its corresponding acoustic energy, then adding the energies using the normal rules of addition, and finally converting the total energy back to its decibel equivalent.

The difference in dB between two sounds represents the ratio of the amplitudes of those two sounds. Because human senses tend to be proportional (i.e., detect whether one sound is twice as big as another) rather than absolute (i.e., detect whether one sound is a given number of pressure units bigger than another), the decibel scale correlates well with human response.

Under laboratory conditions, differences in sound level of 1 dB can be detected by the human ear. In the community, the smallest change in average noise level that can be detected is about 3 dB. A change in sound level of about 10 dB is usually perceived by the average person as a doubling (or halving) of the sound's loudness, and this relation holds true for loud sounds and for quieter sounds. A decrease in sound level of 10 dB actually represents a 90 percent decrease in sound *intensity* but only a 50 percent decrease in perceived *loudness* because of the nonlinear response of the human ear (similar to most human senses).

The one exception to the exclusive use of levels, rather than physical pressure units, to quantify sound is in the case of sonic booms. As described in Section 3, sonic booms are coherent waves with specific characteristics. There is a long-standing tradition of describing individual sonic booms by the amplitude of the shock waves, in pounds per square foot (psf). This is particularly relevant when assessing structural effects as opposed to loudness or cumulative community response. In this study, sonic booms are quantified by either dB or psf, as appropriate for the particular impact being assessed.

Frequency. The normal human ear can hear frequencies from about 20 Hz to about 20,000 Hz. It is most sensitive to sounds in the 1,000 to 4,000 Hz range. When measuring community response to noise, it is common to adjust the frequency content of the measured sound to correspond to the frequency sensitivity of the human ear. This adjustment is called A-weighting (American National Standards Institute 1988). Sound levels that have been so adjusted are referred to as A-weighted sound levels.

The spectral content of the F-22A is somewhat different than other aircraft, including(at high throttle settings) the characteristic nonlinear crackle of high thrust engines. The spectral characteristics of various noises are accounted for by A-weighting, which approximates the response of the human ear. There are other, more detailed, weighting factors that have been applied to sounds. In the 1950s and 1960s, when noise from civilian jet aircraft became an issue,

substantial research was performed to determine what characteristics of jet noise were a problem. The metrics Perceived Noise Level and Effective Perceived Noise Level were developed. These accounted for nonlinear behavior of hearing and the importance of low frequencies at high levels, and for many years airport/airbase noise contours were presented in terms of Noise Exposure Forecast, which was based on Perceived Noise Level and Effective Perceived Noise Level. In the 1970s, however, it was realized that the primary intrusive aspect of aircraft noise was the high noise level, a factor which is well represented by A-weighted levels and L_{dn}. The refinement of Perceived Noise Level, Effective Perceived Noise Level, and Noise Exposure Forecast was not significant in protecting the public from noise.

There has been continuing research on noise metrics and the importance of sound quality, sponsored by the Department of Defense (DoD) for military aircraft noise and by the Federal Aviation Administration (FAA) for civil aircraft noise. The metric L_{dnmr}, which accounts for the increased annoyance of rapid onset rate of sound, is a product of this long-term research. DoD is sponsoring the development of NoiseRunner, which will calculate noise in a more sophisticated manner than done by NOISEMAP and MR_NMAP. At the present time, however, NOISEMAP and MR_NMAP, and the metrics L_{dn} and L_{dnmr}, represent the best current science for analysis of military aircraft.

The amplitude of A-weighted sound levels is measured in dB. It is common for some noise analysts to denote the unit of A-weighted sounds by dBA. As long as the use of A-weighting is understood, there is no difference between dB or dBA: it is only important that the use of A-weighting be made clear. In this Environmental Assessment (EA), sound levels are reported in dB and are A-weighted unless otherwise specified.

A-weighting is appropriate for continuous sounds, which are perceived by the ear. Impulsive sounds, such as sonic booms, are perceived by more than just the ear. When experienced indoors, there can be secondary noise from rattling of the building. Vibrations may also be felt. C-weighting (American National Standards Institute 1988) is applied to such sounds. This is a frequency weighting that is flat over the range of human hearing (about 20 Hz to 20,000 Hz) and rolls off above and below that range. In this study, C-weighted sound levels are used for the assessment of sonic booms and other impulsive sounds. As with A-weighting, the unit is dB, but dBC is sometimes used for clarity. In this study, sound levels are reported in dB, and C-weighting is specified as necessary.

Time Averaging. Sound pressure of a continuous sound varies greatly with time, so it is customary to deal with sound levels that represent averages over time. Levels presented as instantaneous (i.e., as might be read from the dial of a sound level meter) are based on averages of sound energy over either 1/8 second (fast) or 1 second (slow). The formal definitions of fast and slow levels are somewhat complex, with details that are important to the makers and users of instrumentation. They may, however, be thought of as levels corresponding to the root-mean-square sound pressure measured over the 1/8-second or 1-second periods.

The most common uses of the fast or slow sound level in environmental analysis is in the discussion of the maximum sound level that occurs from the action, and in discussions of typical sound levels. Figure D-1 is a chart of A-weighted sound levels from typical sounds. Some (air conditioner, vacuum cleaner) are continuous sounds whose levels are constant for some time. Some (automobile, heavy truck) are the maximum sound during a vehicle passby. Some (urban daytime, urban nighttime) are averages over some extended period. A variety of noise metrics have been developed to describe noise over different time periods. These are described in section 1.2.

1.2 Noise Metrics

Maximum Sound Level

The highest A-weighted sound level measured during a single event in which the sound level changes value as time goes on (e.g., an aircraft overflight) is called the maximum A-weighted sound level or maximum sound level, for short. It is usually abbreviated by ALM, L_{max}, or L_{Amax}. The maximum sound level is important in judging the interference caused by a noise event with conversation, TV or radio listening, sleeping, or other common activities.

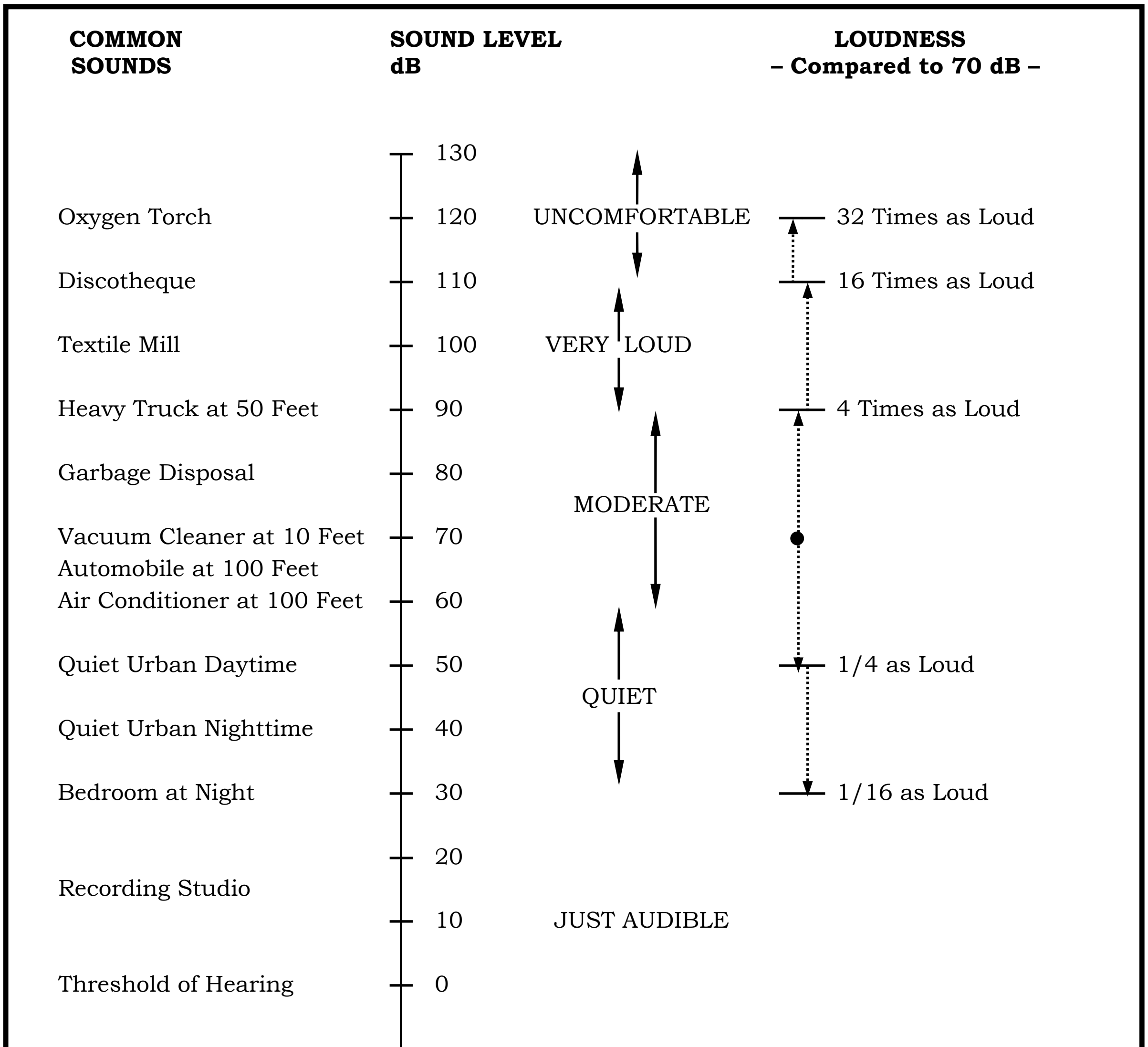
Peak Sound Level

For impulsive sounds, the true instantaneous sound pressure is of interest. For sonic booms, this is the peak pressure of the shock wave, as described in section 3.2 of this appendix. This pressure is usually presented in physical units of pounds per square foot. Sometimes it is represented on the decibel scale, with symbol L_{pk}. Peak sound levels do not use either A or C weighting.

Sound Exposure Level

Individual time-varying noise events have two main characteristics: a sound level that changes throughout the event and a period of time during which the event is heard. Although the maximum sound level, described above, provides some measure of the intrusiveness of the event, it alone does not completely describe the total event. The period of time during which the sound is heard is also significant. The Sound Exposure Level (abbreviated SEL or L_{AE} for A-weighted sounds) combines both of these characteristics into a single metric.

SEL is a composite metric that represents both the intensity of a sound and its duration. Mathematically, the mean square sound pressure is computed over the duration of the event, then multiplied by the duration in seconds, and the resultant product is turned into a sound level. It does not directly represent the sound level heard at any given time, but rather provides a measure of the net impact of the entire acoustic event. It has been well established in the scientific community that SEL measures this impact much more reliably than just the maximum sound level.



Source: *Handbook of Noise Control*, C.M. Harris, Editor, McGraw-Hill Book Co., 1979, and FICON 1992.

Figure D-1. Typical A-Weighted Sound Levels of Common Sounds

Because the SEL and the maximum sound level are both used to describe single events, there is sometimes confusion between the two, so the specific metric used should be clearly stated.

SEL can be computed for C-weighted levels (appropriate for impulsive sounds), and the results denoted CSEL or L_{CE}. SEL for A-weighted sound is sometimes denoted ASEL. Within this study, SEL is used for A-weighted sounds and CSEL for C-weighted.

Equivalent Sound Level

For longer periods of time, total sound is represented by the equivalent continuous sound pressure level (L_{eq}). L_{eq} is the average sound level over some time period (often an hour or a day, but any explicit time span can be specified), with the averaging being done on the same energy basis as used for SEL. SEL and L_{eq} are closely related, differing by (a) whether they are applied over a specific time period or over an event, and (b) whether the duration of the event is included or divided out.

Just as SEL has proven to be a good measure of the noise impact of a single event, L_{eq} has been established to be a good measure of the impact of a series of events during a given time period. Also, while L_{eq} is defined as an average, it is effectively a sum over that time period and is, thus, a measure of the cumulative impact of noise.

Day-Night Average Sound Level

Noise tends to be more intrusive at night than during the day. This effect is accounted for by applying a 10-dB penalty to events that occur after 10 pm and before 7 am. If L_{eq} is computed over a 24-hour period with this nighttime penalty applied, the result is the day-night average sound level (L_{dn}). L_{dn} is the community noise metric recommended by the USEPA (United States Environmental Protection Agency [USEPA] 1974) and has been adopted by most federal agencies (Federal Interagency Committee on Noise 1992). It has been well established that L_{dn} correlates well with community response to noise (Schultz 1978; Finegold *et al.* 1994). This correlation is presented in Section 1.3 of this appendix.

While L_{dn} carries the nomenclature "average," it incorporates all of the noise at a given location. For this reason, L_{dn} is often referred to as a "cumulative" metric. It accounts for the total, or cumulative, noise impact.

It was noted earlier that, for impulsive sounds, C-weighting is more appropriate than A-weighting. The day-night average sound level can be computed for C-weighted noise and is denoted CDNL or L_{Cdn}. This procedure has been standardized, and impact interpretive criteria similar to those for L_{dn} have been developed (Committee on Hearing, Bioacoustics and Biomechanics 1981).

Onset-Adjusted Monthly Day-Night Average Sound Level

Aircraft operations in military airspace, such as MOAs and Warning Areas, generate a noise environment somewhat different from other community noise environments. Overflights are sporadic, occurring at random times and varying from day to day and week to week. This situation differs from most community noise environments, in which noise tends to be

continuous or patterned. Individual military overflight events also differ from typical community noise events in that noise from a low-altitude, high-airspeed flyover can have a rather sudden onset.

To represent these differences, the conventional L_{dn} metric is adjusted to account for the "surprise" effect of the sudden onset of aircraft noise events on humans (Plotkin *et al.* 1987; Stusnick *et al.* 1992; Stusnick *et al.* 1993). For aircraft exhibiting a rate of increase in sound level (called onset rate) of from 15 to 150 dB per second, an adjustment or penalty ranging from 0 to 11 dB is added to the normal SEL. Onset rates above 150 dB per second require an 11 dB penalty, while onset rates below 15 dB per second require no adjustment. The L_{dn} is then determined in the same manner as for conventional aircraft noise events and is designated as Onset-Rate Adjusted Day-Night Average Sound Level (abbreviated L_{dnmr}). Because of the irregular occurrences of aircraft operations, the number of average daily operations is determined by using the calendar month with the highest number of operations. The monthly average is denoted L_{dnmr}. Noise levels are calculated the same way for both L_{dn} and L_{dnmr}. L_{dnmr} is interpreted by the same criteria as used for L_{dn}.

1.3 NOISE IMPACT

COMMUNITY REACTION

Studies of community annoyance to numerous types of environmental noise show that L_{dn} correlates well with impact. Schultz (1978) showed a consistent relationship between L_{dn} and annoyance. Shultz's original curve fit (Figure D-2) shows that there is a remarkable consistency in results of attitudinal surveys which relate the percentages of groups of people who express various degrees of annoyance when exposed to different L_{dn}.

A more recent study has reaffirmed this relationship (Fidell *et al.* 1991). Figure D-3 (Federal Interagency Committee on Noise 1992) shows an updated form of the curve fit (Finegold *et al.* 1994) in comparison with the original. The updated fit, which does not differ substantially from the original, is the current preferred form. In general, correlation coefficients of 0.85 to 0.95 are found between the percentages of groups of people highly annoyed and the level of average noise exposure. The correlation coefficients for the annoyance of individuals are relatively low, however, on the order of 0.5 or less. This is not surprising, considering the varying personal factors that influence the manner in which individuals react to noise. Nevertheless, findings substantiate that community annoyance to aircraft noise is represented quite reliably using L_{dn}.

As noted earlier for SEL, L_{dn} does not represent the sound level heard at any particular time, but rather represents the total sound exposure. L_{dn} accounts for the sound level of individual noise events, the duration of those events, and the number of events. Its use is endorsed by the scientific community (American National Standards Institute 1980, 1988; USEPA 1974; Federal Interagency Committee on Urban Noise 1980; Federal Interagency Committee on Noise 1992).

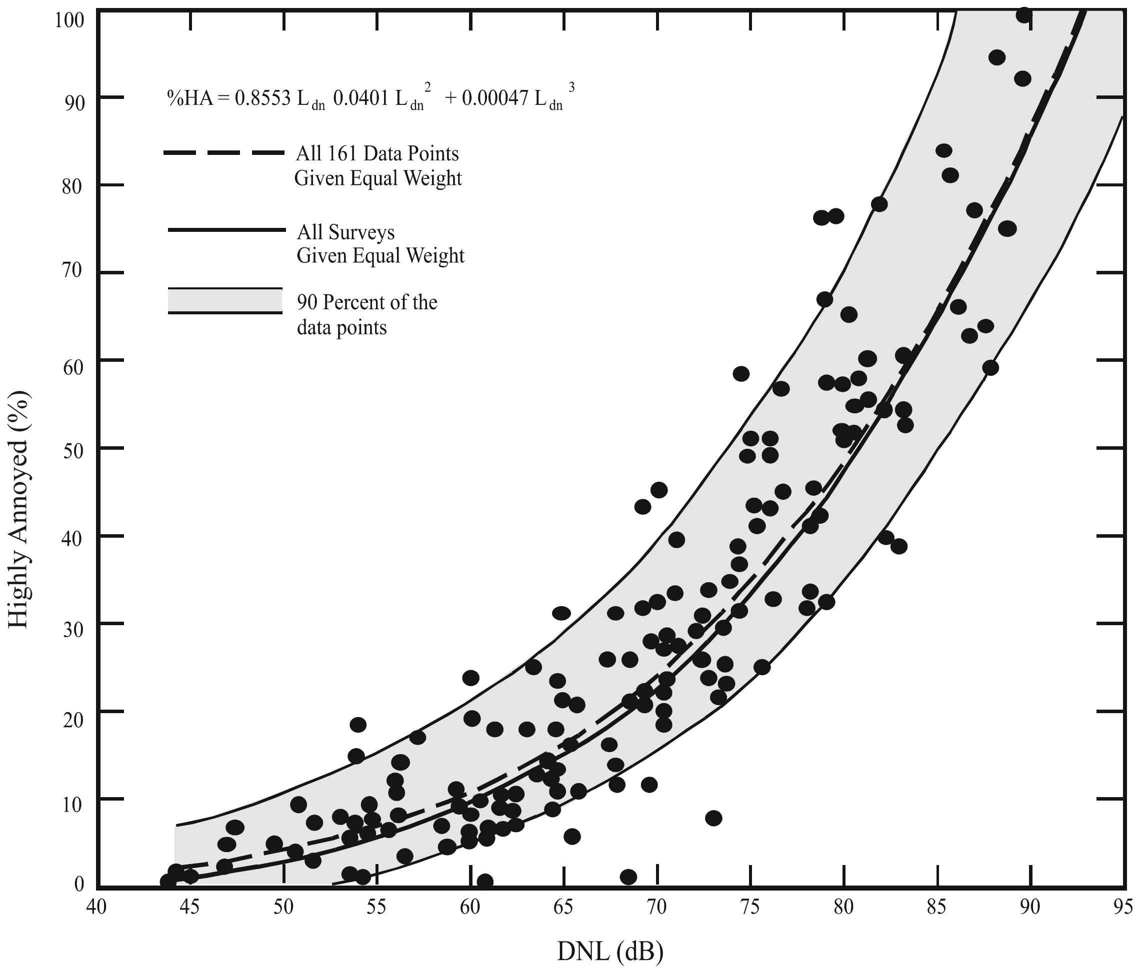


Figure D-2. Community Surveys of Noise Annoyance (Source: Schultz 1978)

While L_{dn} is the best metric for quantitatively assessing cumulative noise impact, it does not lend itself to intuitive interpretation by non-experts. Accordingly, it is common for environmental noise analyses to include other metrics for illustrative purposes. A general indication of the noise environment can be presented by noting the maximum sound levels which can occur and the number of times per day noise events will be loud enough to be heard. Use of other metrics as supplements to L_{dn} has been endorsed by federal agencies (Federal Interagency Committee on Noise 1992).

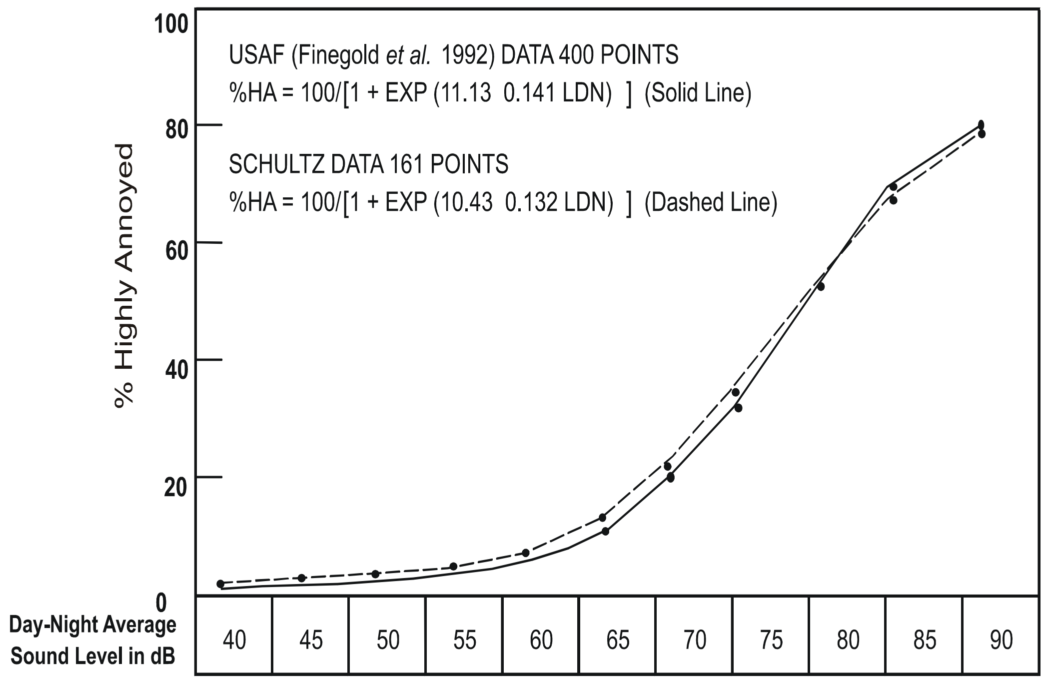
The Schultz curve is generally applied to annual average L_{dn}. In Section 1.2, L_{dnmr} was described and presented as being appropriate for quantifying noise in military airspace. In the current study, the Schultz curve is used with L_{dnmr} as the noise metric. L_{dnmr} is always equal to or greater than L_{dn}, so impact is generally higher than would have been predicted if the onset rate and busiest-month adjustments were not accounted for.

There are several points of interest in the noise-annoyance relation. The first is L_{dn} of 65 dB. This is a level most commonly used for noise planning purposes and represents a compromise between community impact and the need for activities like aviation which do cause noise. Areas exposed to L_{dn} above 65 dB are generally not considered suitable for residential use. The second is L_{dn} of 55 dB, which was identified by USEPA as a level "...requisite to protect the public health and welfare with an adequate margin of safety," (USEPA 1974) which is essentially a level below which adverse impact is not expected. The third is L_{dn} of 75 dB. This is the lowest level at which adverse health effects could be credible (USEPA 1974). The very high annoyance levels correlated with L_{dn} of 75 dB make such areas unsuitable for residential land use.

Sonic boom exposure is measured by C-weighting, with the corresponding cumulative metric being CDNL. Correlation between CDNL and annoyance has been established, based on community reaction to impulsive sounds (Committee on Hearing, Bioacoustics and Biomechanics 1981). Values of the C-weighted equivalent to the Schultz curve are different than that of the Schultz curve itself. Table D-1 shows the relation between annoyance, L_{dn}, and CDNL.

TABLE D-1. RELATION BETWEEN ANNOYANCE, L_{DN} AND CDNL

CDNL	*% Highly Annoyed*	*L_{dn}*
48	2	50
52	4	55
57	8	60
61	14	65
65	23	70
69	35	75



Calculated %HA Points											
USAF	0.41	0.831	1.66	3.31	6.48	12.29	22.1	36.47	53.74	70.16	82.64
SCHULTZ	0.576	1.11	2.12	4.03	7.52	13.59	23.32	37.05	53.25	68.78	81

Figure D-3. Response of Communities to Noise; Comparison of Original (Schultz 1978) and Current (Finegold et al. 1994) Curve Fits.

Interpretation of CDNL from impulsive noise is accomplished by using the CDNL versus annoyance values in Table D-1. CDNL can be interpreted in terms of an "equivalent annoyance" L_{dn}. For example, CDNL of 52, 61, and 69 dB are equivalent to L_{dn} of 55, 65, and 75 dB, respectively. If both continuous and impulsive noise occurs in the same area, impacts are assessed separately for each.

Land Use Compatibility

As noted above, the inherent variability between individuals makes it impossible to predict accurately how any individual will react to a given noise event. Nevertheless, when a community is considered as a whole, its overall reaction to noise can be represented with a high degree of confidence. As described above, the best noise exposure metric for this correlation is the L_{dn} or L_{dnmr} for military overflights. Impulsive noise can be assessed by relating CDNL to an "equivalent annoyance" L_{dn}, as outlined in Section 1.3.1.

In June 1980, an ad hoc Federal Interagency Committee on Urban Noise published guidelines (Federal Interagency Committee on Urban Noise 1980) relating L_{dn} to compatible land uses. This committee was composed of representatives from DoD, Transportation, and Housing and Urban Development; USEPA; and the Veterans Administration. Since the issuance of these guidelines, federal agencies have generally adopted these guidelines for their noise analyses.

Following the lead of the committee, DoD and FAA adopted the concept of land-use compatibility as the accepted measure of aircraft noise effect. The FAA included the committee's guidelines in the Federal Aviation Regulations (United States Department of Transportation 1984). These guidelines are reprinted in Table D-2, along with the explanatory notes included in the regulation. Although these guidelines are not mandatory (note the footnote "*" in the table), they provide the best means for determining noise impact in airport communities. In general, residential land uses normally are not compatible with outdoor L_{dn} values above 65 dB, and the extent of land areas and populations exposed to L_{dn} of 65 dB and higher provides the best means for assessing the noise impacts of alternative aircraft actions. In some cases, where noise change exceeds 3 dB, the 1992 Federal Interagency Committee on Noise indicates the 60 dB L_{dn} may be a more appropriate incompatibility level for densely populated areas.

2.0 NOISE EFFECTS

The discussion in Section 1.3 presents the global effect of noise on communities. The following sections describe particular noise effects.

Table D-2. Land-Use Compatibility With Yearly Day-Night Average Sound Levels

Land Use	Yearly Day-Night Average Sound Level (L_{dn}) in Decibels					
	Below 65	65–70	70–75	75–80	80–85	Over 85
Residential						
Residential, other than mobile homes and transient lodgings	Y	N(1)	N(1)	N	N	N
Mobile home parks	Y	N	N	N	N	N
Transient lodgings	Y	N(1)	N(1)	N(1)	N	N
Public Use						
Schools	Y	N(1)	N(1)	N	N	N
Hospitals and nursing homes	Y	25	30	N	N	N
Churches, auditoria, and concert halls	Y	25	30	N	N	N
Government services	Y	Y	25	30	N	N
Transportation	Y	Y	Y(2)	Y(3)	Y(4)	Y(4)
Parking	Y	Y	Y(2)	Y(3)	Y(4)	N
Commercial Use						
Offices, business and professional	Y	Y	25	30	N	N
Wholesale and retail—building materials, hardware, and farm equipment	Y	Y	Y(2)	Y(3)	Y(4)	N
Retail trade—general	Y	Y	25	30	N	N
Utilities	Y	Y	Y(2)	Y(3)	Y(4)	N
Communication	Y	Y	25	30	N	N
Manufacturing and Production						
Manufacturing, general	Y	Y	Y(2)	Y(3)	Y(4)	N
Photographic and optical	Y	Y	25	30	N	N
Agriculture (except livestock) and forestry	Y	Y(6)	Y(7)	Y(8)	Y(8)	Y(8)
Livestock farming and breeding	Y	Y(6)	Y(7)	N	N	N
Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y
Recreational						
Outdoor sports arenas and spectator sports	Y	Y(5)	Y(5)	N	N	N
Outdoor music shells, amphitheaters	Y	N	N	N	N	N
Nature exhibits and zoos	Y	Y	N	N	N	N
Amusements, parks, resorts, and camps	Y	Y	Y	N	N	N
Golf courses, riding stables, and water recreation	Y	Y	25	30	N	N

Numbers in parentheses refer to notes.

* The designations contained in this table do not constitute a federal determination that any use of land covered by the program is acceptable or unacceptable under federal, state, or local law. The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities. FAA determinations under Part 150 are not intended to substitute federally determined land uses for those determined to be appropriate by local authorities in response to locally determined needs and values in achieving noise-compatible land uses.

KEY TO TABLE D-2

Y (YES) = Land Use and related structures compatible without restrictions.
N (No) = Land Use and related structures are not compatible and should be prohibited.
NLR = Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.
25, 30, or 35 = Land Use and related structures generally compatible; measures to achieve NLR of 25, 30, or 35 dB must be incorporated into design and construction of structures.

NOTES FOR TABLE D-2

(1) Where the community determines that residential or school uses must be allowed, measures to achieve outdoor-to-indoor Noise Level Reduction (NLR) of at least 25 dB and 30 dB should be incorporated into building codes and be considered in individual approvals. Normal residential construction can be expected to provide an NLR of 20 dB; thus the reduction requirements are often stated as 5, 10, or 15 dB over standard construction and normally assume mechanical ventilation and closed windows year-round. However, the use of NLR criteria will not eliminate outdoor noise problems.
(2) Measures to achieve NLR 25 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.
(3) Measures to achieve NLR 30 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.
(4) Measures to achieve NLR 35 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.
(5) Land-use compatible provided special sound reinforcement systems are installed.
(6) Residential buildings require an NLR of 25.
(7) Residential buildings require an NLR of 30.
(8) Residential buildings not permitted.

2.1 Hearing Loss

Noise-induced hearing loss is probably the best defined of the potential effects of human exposure to excessive noise. Federal workplace standards for protection from hearing loss allow a time-average level of 90 dB over an 8-hour work period, or 85 dB averaged over a 16-hour period. Even the most protective criterion (no measurable hearing loss for the most sensitive portion of the population at the ear's most sensitive frequency, 4,000 Hz, after a 40-year exposure) suggests a time-average sound level of 70 dB over a 24-hour period (USEPA 1974). Since it is unlikely that airport neighbors will remain outside their homes 24 hours per day for extended periods of time, there is little possibility of hearing loss below a DNL of 75 dB, and this level is extremely conservative.

2.2 Nonauditory Health Effects

Nonauditory health effects of long-term noise exposure, where noise may act as a risk factor, have not been found to occur at levels below those protective against noise-induced hearing loss, described above. Most studies attempting to clarify such health effects have found that noise exposure levels established for hearing protection will also protect against any potential nonauditory health effects, at least in workplace conditions. The best scientific summary of these findings is contained in the lead paper at the National Institutes of Health Conference on Noise and Hearing Loss, held on January 22–24, 1990, in Washington, D.C., which states "The nonauditory effects of chronic noise exposure, when noise is suspected to act as one of the risk factors in the development of hypertension, cardiovascular disease, and other nervous disorders, have never been proven to occur as chronic manifestations at levels below these criteria (an average of 75 dBA for complete protection against hearing loss for an eight-hour day)" (von Gierke 1990; parenthetical wording added for clarification). At the International Congress (1988) on Noise as a Public Health Problem, most studies attempting to clarify such health effects did not find them at levels below the criteria protective of noise-induced hearing loss; and even above these criteria, results regarding such health effects were ambiguous.

Consequently, it can be concluded that establishing and enforcing exposure levels protecting against noise-induced hearing loss would not only solve the noise-induced hearing loss problem but also any potential nonauditory health effects in the work place.

Although these findings were directed specifically at noise effects in the work place, they are equally applicable to aircraft noise effects in the community environment. Research studies regarding the nonauditory health effects of aircraft noise are ambiguous, at best, and often contradictory. Yet, even those studies which purport to find such health effects use time-average noise levels of 75 dB and higher for their research.

For example, in an often-quoted paper, two University of California at Los Angeles researchers found a relation between aircraft noise levels under the approach path to Los Angeles International Airport and increased mortality rates among the exposed residents by using an average noise exposure level greater than 75 dB for the "noise-exposed" population (Meecham and Shaw 1979). Nevertheless, three other University of California at Los Angeles professors analyzed those same data and found no relation between noise exposure and mortality rates (Frerichs *et al*. 1980).

As a second example, two other University of California at Los Angeles researchers used this same population near Los Angeles International Airport to show a higher rate of birth defects during the period of 1970 to 1972 when compared with a control group residing away from the airport (Jones and Tauscher 1978). Based on this report, a separate group at the United States Centers for Disease Control performed a more thorough study of populations near Atlanta's Hartsfield International Airport for 1970 to 1972 and found no relation in their study of 17 identified categories of birth defects to aircraft noise levels above 65 dB (Edmonds 1979).

A recent review of health effects, prepared by a Committee of the Health Council of The Netherlands (Committee of the Health Council of the Netherlands 1996), analyzed currently available published information on this topic. The committee concluded that the threshold for possible long-term health effects was a 16-hour (6:00 a.m. to 10:00 p.m.) L_{eq} of 70 dB. Projecting this to 24 hours and applying the 10 dB nighttime penalty used with DNL, this corresponds to DNL of about 75 dB. The study also affirmed the risk threshold for hearing loss, as discussed earlier.

In summary, there is no scientific basis for a claim that potential health effects exist for aircraft time-average sound levels below 75 dB.

2.3 Annoyance

The primary effect of aircraft noise on exposed communities is one of annoyance. Noise annoyance is defined by the USEPA as any negative subjective reaction on the part of an individual or group (USEPA 1974). As noted in the discussion of DNL above, community annoyance is best measured by that metric.

Because the USEPA Levels Document (USEPA 1974) identified DNL of 55 dB as ". . . requisite to protect public health and welfare with an adequate margin of safety," it is commonly assumed that 55 dB should be adopted as a criterion for community noise analysis. From a noise exposure perspective, that would be an ideal selection. However, financial and technical resources are generally not available to achieve that goal. Most agencies have identified DNL of 65 dB as a criterion which protects those most impacted by noise, and which can often be achieved on a practical basis (Federal Interagency Committee on Noise 1992). This corresponds to about 13 percent of the exposed population being highly annoyed.

Although DNL of 65 dB is widely used as a benchmark for significant noise impact, and is often an acceptable compromise, it is not a statutory limit, and it is appropriate to consider other thresholds in particular cases.

In this Draft EA, no specific threshold is used. The noise in the affected environment is evaluated on the basis of the information presented in this appendix and in the body of the Draft EA.

Community annoyance from sonic booms is based on CDNL, as discussed in Section 1.3. These effects are implicitly included in the "equivalent annoyance" CDNL values in Table D-1, since those were developed from actual community noise impact.

2.4 Speech Interference

Speech interference associated with aircraft noise is a primary cause of annoyance to individuals on the ground. The disruption of routine activities in the home, such as radio or television listening, telephone use, or family conversation, gives rise to frustration and irritation. The quality of speech communication is also important in classrooms, offices, and industrial settings and can cause fatigue and vocal strain in those who attempt to communicate over the noise. Research has shown that the use of the SEL metric will measure speech interference successfully, and that a SEL exceeding 65 dB will begin to interfere with speech communication.

2.5 Sleep Interference

Sleep interference is another source of annoyance associated with aircraft noise. This is especially true because of the intermittent nature and content of aircraft noise, which is more disturbing than continuous noise of equal energy and neutral meaning.

Sleep interference may be measured in either of two ways. "Arousal" represents actual awakening from sleep, while a change in "sleep stage" represents a shift from one of four sleep stages to another stage of lighter sleep without actual awakening. In general, arousal requires a somewhat higher noise level than does a change in sleep stage.

An analysis sponsored by the Air Force summarized 21 published studies concerning the effects of noise on sleep (Pearsons *et al*. 1989). The analysis concluded that a lack of reliable in-home studies, combined with large differences among the results from the various laboratory studies, did not permit development of an acceptably accurate assessment procedure. The noise events used in the laboratory studies and in contrived in-home studies were presented at much higher rates of occurrence than would normally be experienced. None of the laboratory studies were of sufficiently long duration to determine any effects of habituation, such as that which would occur under normal community conditions. A recent extensive study of sleep interference in people's own homes (Ollerhead 1992) showed very little disturbance from aircraft noise.

There is some controversy associated with the recent studies, so a conservative approach should be taken in judging sleep interference. Based on older data, the USEPA identified an indoor DNL of 45 dB as necessary to protect against sleep interference (USEPA 1974). Assuming a very conservative structural noise insulation of 20 dB for typical dwelling units, this corresponds to an outdoor DNL of 65 dB as minimizing sleep interference.

A 1984 publication reviewed the probability of arousal or behavioral awakening in terms of SEL (Kryter 1984). Figure D-4, extracted from Figure 10.37 of Kryter (1984), indicates that an indoor SEL of 65 dB or lower should awaken less than 5 percent of those exposed. These results do not include any habituation over time by sleeping subjects. Nevertheless, this provides a reasonable guideline for assessing sleep interference and corresponds to similar guidance for speech interference, as noted above.

2.6 Noise Effects on Domestic Animals and Wildlife

Animal species differ greatly in their responses to noise. Each species has adapted, physically and behaviorally, to fill its ecological role in nature, and its hearing ability usually reflects that role. Animals rely on their hearing to avoid predators, obtain food, and communicate with and attract other members of their species. Aircraft noise may mask or interfere with these functions. Secondary effects may include nonauditory effects similar to those exhibited by humans: stress, hypertension, and other nervous disorders. Tertiary effects may include interference with mating and resultant population declines.

A review of the effects of noise and sonic boom on livestock and wildlife is presented in Section 4.5 in this Draft EA.

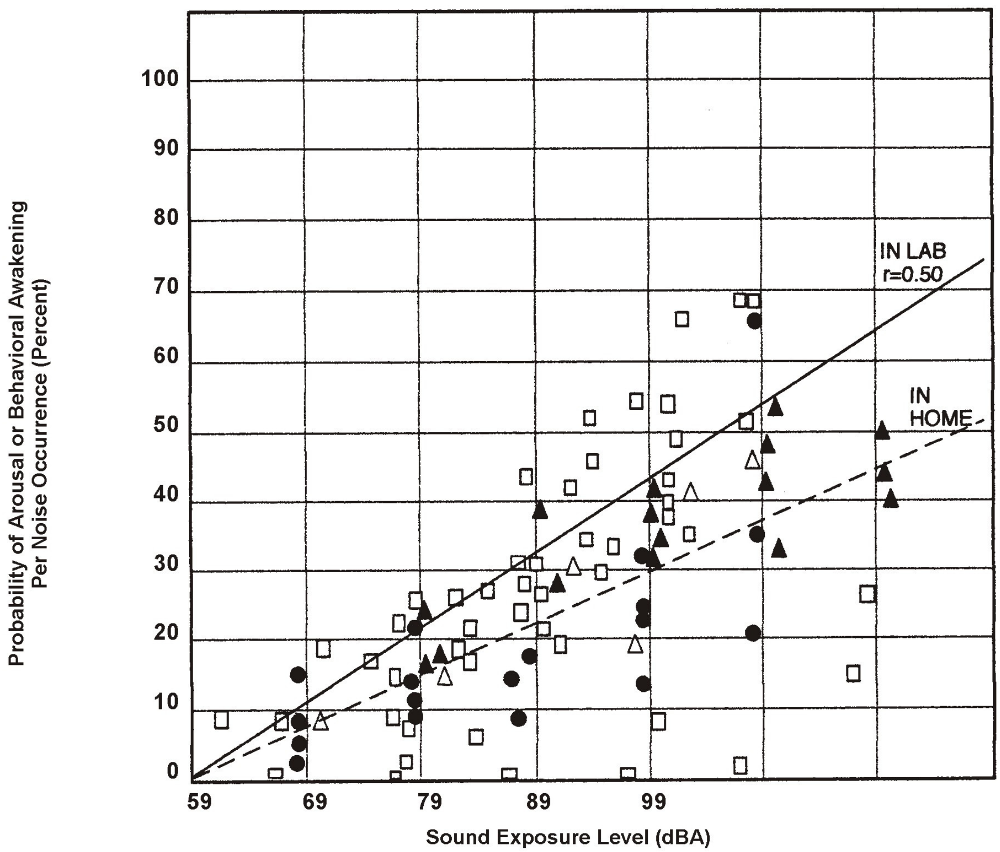
2.7 Noise Effects on Structures

Subsonic Aircraft Noise

Normally, the most sensitive components of a structure to airborne noise are the windows and, infrequently, the plastered walls and ceilings. An evaluation of the peak sound pressures impinging on the structure is normally sufficient to determine the possibility of damage. In general, at sound levels above 130 dB, there is the possibility of the excitation of structural component resonance. While certain frequencies (such as 30 Hz for window breakage) may be of more concern than other frequencies, conservatively, only sounds lasting more than one second above a sound level of 130 dB are potentially damaging to structural components (National Research Council/National Academy of Sciences 1977).

A study directed specifically at low-altitude, high-speed aircraft showed that there is little probability of structural damage from such operations (Sutherland 1989). One finding in that study is that sound levels at damaging frequencies (e.g., 30 Hz for window breakage or 15 to 25 Hz for whole-house response) are rarely above 130 dB.

Noise-induced structural vibration may also cause annoyance to dwelling occupants because of induced secondary vibrations, or "rattle," of objects within the dwelling, such as hanging pictures, dishes, plaques, and bric-a-brac. Window panes may also vibrate noticeably when exposed to high levels of airborne noise, causing homeowners to fear breakage. In general, such noise-induced vibrations occur at sound levels above those considered normally incompatible with residential land use. Thus assessments of noise exposure levels for compatible land use should also be protective of noise-induced secondary vibrations.



LEGEND

- ☐ Laboratory Studies, Variety of Noises, Lukas
- ● Steady State (In Home)
- ▲ Transient (In Home)
- △ Truck Noise, Laboratory Study, Thiesen
  Transformer, Transmission Line, Window Air Conditioner, and Distant Traffic Noise, Horonjeff

Figure D-4. Probability of Arousal or Behavioral Awakening in Terms of Sound Exposure Level

Sonic Booms

Sonic booms are commonly associated with structural damage. Most damage claims are for brittle objects, such as glass and plaster. Table D-3 summarizes the threshold of damage that might be expected at various overpressures. There is a large degree of variability in damage experience, and much damage depends on the pre-existing condition of a structure. Breakage data for glass, for example, spans a range of two to three orders of magnitude at a given overpressure. At 1 psf, the probability of a window breaking ranges from one in a billion (Sutherland 1990) to one in a million (Hershey and Higgins 1976). These damage rates are associated with a combination of boom load and glass condition. At 10 psf, the probability of breakage is between one in a hundred and one in a thousand. Laboratory tests of glass (White 1972) have shown that properly installed window glass will not break at overpressures below 10 psf, even when subjected to repeated booms, but in the real world glass is not in pristine condition.

Damage to plaster occurs at similar ranges to glass damage. Plaster has a compounding issue in that it will often crack due to shrinkage while curing, or from stresses as a structure settles, even in the absence of outside loads. Sonic boom damage to plaster often occurs when internal stresses are high from these factors.

Some degree of damage to glass and plaster should thus be expected whenever there are sonic booms, but usually at the low rates noted above. In general, structural damage from sonic booms should be expected only for overpressures above 10 psf.

2.8 Noise Effects on Terrain

Subsonic Aircraft Noise

Members of the public often believe that noise from low-flying aircraft can cause avalanches or landslides by disturbing fragile soil or snow structures in mountainous areas. There are no known instances of such effects, and it is considered improbable that such effects will result from routine, subsonic aircraft operations.

Sonic Booms

In contrast to subsonic noise, sonic booms are considered to be a potential trigger for snow avalanches. Avalanches are highly dependent on the physical status of the snow, and do occur spontaneously. They can be triggered by minor disturbances, and there are documented accounts of sonic booms triggering avalanches. Switzerland routinely restricts supersonic flight during avalanche season.

Landslides are not an issue for sonic booms. There was one anecdotal report of a minor landslide from a sonic boom generated by the Space Shuttle during landing, but there is no credible mechanism or consistent pattern of reports.

Table D-3. Possible Damage to Structures From Sonic Booms		
Sonic Boom Overpressure Nominal (psf)	*Item Affected*	*Type of Damage*
0.5 - 2	Plaster	Fine cracks; extension of existing cracks; more in ceilings; over door frames; between some plaster boards.
	Glass	Rarely shattered; either partial or extension of existing cracks.
	Roof	Slippage of existing loose tiles/slates; sometimes new cracking of old slates at nail hole.
	Damage to outside walls	Existing cracks in stucco extended.
	Bric-a-brac	Those carefully balanced or on edges can fall; fine glass, such as large goblets, can fall and break.
	Other	Dust falls in chimneys.
2 - 4	Glass, plaster, roofs, ceilings	For elements nominally in good condition, failures show that would have been difficult to forecast in terms of their existing localized condition.
4 - 10	Glass	Regular failures within a population of well-installed glass; industrial as well as domestic greenhouses.
	Plaster	Partial ceiling collapse of good plaster; complete collapse of very new, incompletely cured, or very old plaster.
	Roofs	High probability rate of failure in slurry wash in nominally good state; some chance of failures in tiles on modern roofs; light roofs (bungalow) or large area can move bodily.
	Walls (out)	Old, free standing, in fairly good condition can collapse.
	Walls (in)	Internal ("party") walls known to move at 10 psf.
Greater than 10	Glass	Some good window glass will fail when exposed to regular sonic booms from the same direction. Glass with existing faults could shatter and fly. Large window frames move.
	Plaster	Most plaster affected.
	Ceilings	Plaster boards displaced by nail popping.
	Roofs	Most slate/slurry roofs affected, some badly; large roofs having good tile can be affected; some roofs bodily displaced causing gale-end and wall-plate cracks; domestic chimneys dislodged if not in good condition.
	Walls	Internal party walls can move even if carrying fittings such as hand basins or taps; secondary damage due to water leakage.
	Bric-a-brac	Some nominally secure items can fall; e.g., large pictures, especially if fixed to party walls.

Source: Haber and Nakaki 1989

2.9 Noise Effects on Historical and Archaeological Sites

Because of the potential for increased fragility of structural components of historical buildings and other historical sites, aircraft noise may affect such sites more severely than newer, modern structures. Again, there are few scientific studies of such effects to provide guidance for their assessment.

One study involved the measurements of sound levels and structural vibration levels in a superbly restored plantation house, originally built in 1795, and now situated approximately 1,500 feet from the centerline at the departure end of Runway 19L at Washington Dulles International Airport. These measurements were made in connection with the proposed scheduled operation of the supersonic Concorde airplane at Dulles (Wesler 1977). There was special concern for the building's windows, since roughly half of the 324 panes were original. No instances of structural damage were found. Interestingly, despite the high levels of noise during Concorde takeoffs, the induced structural vibration levels were actually less than those induced by touring groups and vacuum cleaning within the building itself.

As noted above for the noise effects of noise-induced vibrations on normal structures, assessments of noise exposure levels for normally compatible land uses should also be protective of historic and archaeological sites.

3.0 NOISE MODELING

3.1 Subsonic Aircraft Noise

An aircraft in subsonic flight generally emits noise from two sources: the engines and flow noise around the airframe. Noise generation mechanisms are complex and, in practical models, the noise sources must be based on measured data. The Air Force has developed a series of computer models and aircraft noise databases for this purpose. The models include NOISEMAP (Moulton 1992) for noise around airbases, ROUTEMAP (Lucas and Plotkin 1988) for noise associated with low-level training routes, and MR_NMAP (Lucas and Calamia 1996) for use in MOAs and ranges. These models use the NOISEFILE database developed by the Air Force. NOISEFILE data includes SEL and L_{Amax} as a function of speed and power setting for aircraft in straight flight.

Noise from an individual aircraft is a time-varying continuous sound. It is first audible as the aircraft approaches, increases to a maximum when the aircraft is near its closest point, then diminishes as it departs. The noise depends on the speed and power setting of the aircraft and its trajectory. The models noted above divide the trajectory into segments whose noise can be computed from the data in NOISEFILE. The contributions from these segments are summed.

MR_NMAP was used to compute noise levels in the airspace. The primary noise metric computed by MR_NMAP was L_{dnmr} averaged over each airspace. Supporting routines from NOISEMAP were used to calculate SEL and L_{Amax} for various flight altitudes and lateral offsets from a ground receiver position.

3.2 Sonic Booms

When an aircraft moves through the air, it pushes the air out of its way. At subsonic speeds, the displaced air forms a pressure wave that disperses rapidly. At supersonic speeds, the aircraft is moving too quickly for the wave to disperse, so it remains as a coherent wave. This wave is a sonic boom. When heard at the ground, a sonic boom consists of two shock waves (one associated with the forward part of the aircraft, the other with the rear part) of approximately equal strength and (for fighter aircraft) separated by 100 to 200 milliseconds. When plotted, this pair of shock waves and the expanding flow between them have the appearance of a capital letter "N," so a sonic boom pressure wave is usually called an "N-wave." An N-wave has a characteristic "bang-bang" sound that can be startling. Figure D-5 shows the generation and evolution of a sonic boom N-wave under the aircraft. Figure D-6 shows the sonic boom pattern for an aircraft in steady supersonic flight. The boom forms a cone that is said to sweep out a "carpet" under the flight track.

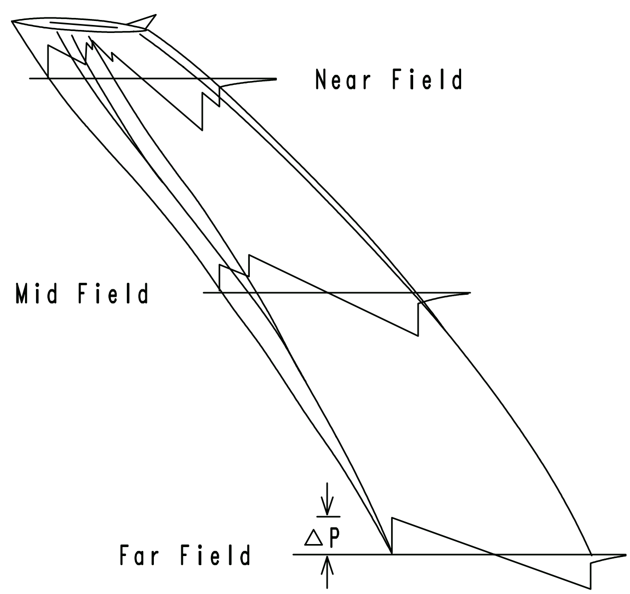


Figure D-5. Sonic Boom Generation, and Evolution to N-wave

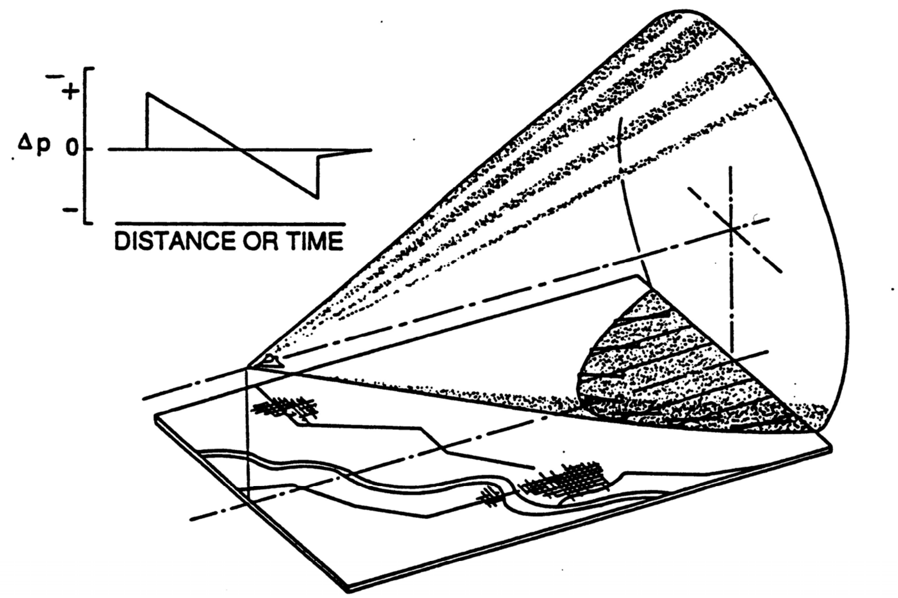


Figure D-6. Sonic Boom Carpet in Steady Flight

The complete ground pattern of a sonic boom depends on the size, shape, speed, and trajectory of the aircraft. Even for a nominally steady mission, the aircraft must accelerate to supersonic speed at the start, decelerate back to subsonic speed at the end, and usually change altitude. Figure D-7 illustrates the complexity of a nominal full mission.

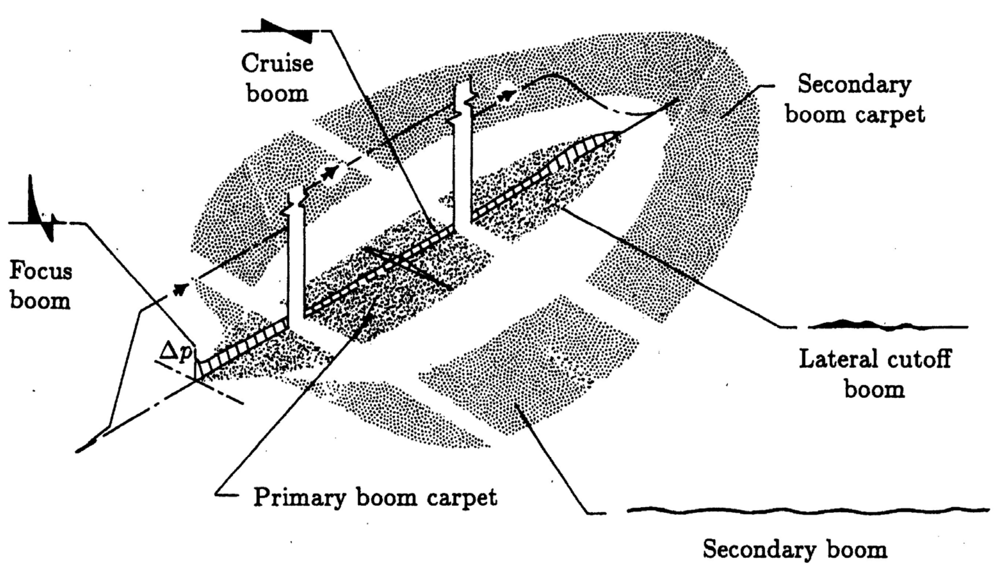


Figure D-7. Complex Sonic Boom Pattern for Full Mission

The Air Force's PCBoom4 computer program (Plotkin and Grandi 2002) can be used to compute the complete sonic boom footprint for a given single event, accounting for details of a particular maneuver.

Supersonic operations for the proposed action and alternatives are, however, associated with air combat training, which cannot be described in the deterministic manner that PCBoom4 requires. Supersonic events occur as aircraft approach an engagement, break at the end, and maneuver for advantage during the engagement. Long time cumulative sonic boom exposure, CDNL, is meaningful for this kind of environment.

Long-term sonic boom measurement projects have been conducted in four supersonic air combat training airspaces: White Sands, New Mexico (Plotkin *et al.* 1989); the eastern portion of the Goldwater Range, Arizona (Plotkin *et al.* 1992); the Elgin MOA at Nellis AFB, Nevada (Frampton *et al.* 1993); and the western portion of the Goldwater Range (Page *et al.* 1994). These studies included analysis of schedule and air combat maneuvering instrumentation data and supported development of the 1992 BOOMAP model (Plotkin *et al.* 1992). The current version of BOOMAP (Frampton *et al*. 1993; Plotkin 1996) incorporates results from all four studies. Because BOOMAP is directly based on long-term measurements, it implicitly accounts for such variables as maneuvers, statistical variations in operations, atmosphere effects, and other factors.

Figure D-8 shows a sample of supersonic flight tracks measured in the air combat training airspace at White Sands (Plotkin *et al.* 1989). The tracks fall into an elliptical pattern aligned with preferred engagement directions in the airspace. Figure D-9 shows the CDNL contours that were fit to six months of measured booms in that airspace. The subsequent measurement programs refined the fit, and demonstrated that the elliptical maneuver area is related to the size and shape of the airspace (Frampton *et al*. 1993). BOOMAP quantifies the size and shape of CDNL contours, and also numbers of booms per day, in air combat training airspaces. That model was used for prediction of cumulative sonic boom exposure in the study area.

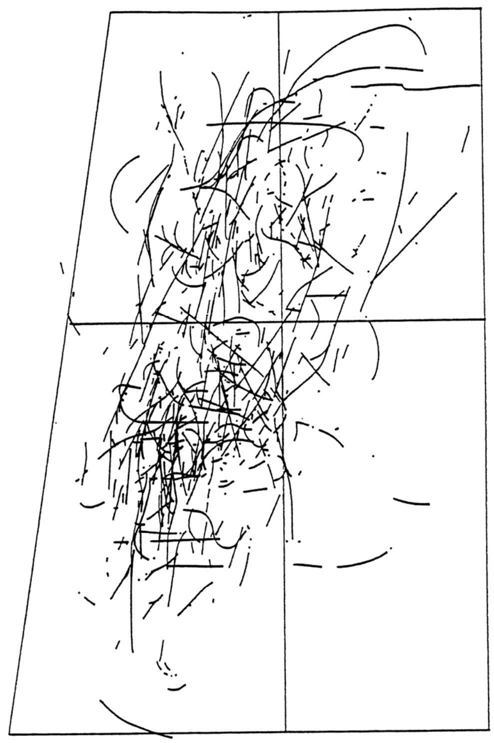


Figure D-8. Supersonic Flight Tracks in Supersonic Air Combat Training Airspace

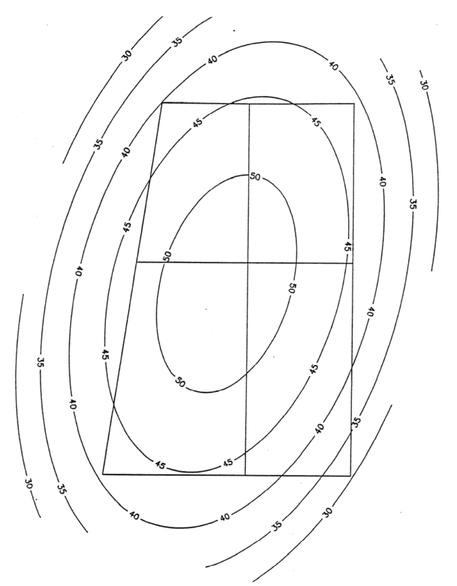


Figure D-9. Elliptical CDNL Contours in Supersonic Air Combat Training Airspace

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Appendix E
Review of Effects of Aircraft Noise, Chaff, and Flares on Biological Resources

APPENDIX E REVIEW OF EFFECTS OF AIRCRAFT NOISE, CHAFF, AND FLARES ON BIOLOGICAL RESOURCES

1.0 Introduction

This biological resources appendix addresses the effects of aircraft noise, including sonic booms, on wildlife and domestic animals. This appendix also considers the effects of training chaff and flares on biological resources under the training airspaces used by the F-15C, F-15E, and the proposed use by F-22A.

2.0 Aircraft Noise

The review of the noise effects literature shows that the most documented reaction of animals newly or infrequently exposed to low-altitude aircraft and sonic booms is the "startle effect." Although an observer's interpretation of the startle effect is behavioral (e.g., the animal runs in response to the sound or flinches and remains in place), it does have a physiological basis. The startle effect is a reflex; it is an autonomic reaction to loud, sudden noise (Westman and Walters 1981, Harrington and Veitch 1991). Increased heart rate and muscle flexion are the typical physiological responses.

The literature indicates that the type of noise that can stimulate the startle reflex is highly variable among animal species (Manci *et al.* 1988). In general, studies have indicated that close, loud, and sudden noises that are combined with a visual stimulus produce the most intense reactions. Rotary wing aircraft (helicopters) generally induce the startle effect more frequently than fixed wing aircraft (Gladwin *et al.* 1988, Ward *et al.* 1999). Similarly the "crack-crack" of a nearby sonic boom has a higher potential to startle an animal compared to the thunder-like sound from a distant sonic boom. External physical variables, such as landscape structure and wind, can also lessen the animal's perception of and response to aircraft noise (Ward *et al.* 1999).

Animals can habituate to fixed wing aircraft noise as demonstrated under controlled conditions (e.g., Conomy *et al.* 1998, Krausman *et al.* 1998) and by observations reported by biologists working in parks and wildlife refuges (Gladwin *et al.* 1988). Brown *et al.* (1999) defined habituation as "… an active learning process that permits individuals to discard a response to a recurring stimulus for which constant response is biologically inappropriate without impairment of their ability to respond to other stimuli." However, species can differ in their ability to habituate to aircraft noise, particularly the sporadic noise associated with military aircraft training (e.g., Conomy *et al.* 1998). Furthermore, there are no studies that have investigated the potential for adverse effects to wildlife due to long-term exposure to aircraft noise.

Ungulates

Wild ungulates appear to vary in sensitivity to aircraft noise. Responses reported in the literature varied from no effect and habituation to panic reactions followed by stampeding (Weisenberger *et al.* 1996; see reviews in Manci *et al.* 1988). Aircraft noise has the potential to be most detrimental during periods of stress, especially winter, gestation, and calving (DeForge 1981). Krausman *et al.* (1998) studied the response of wild bighorn sheep (*Ovis canadensis*) in a

790-acre enclosure to frequent F-16 overflight at 395 feet AGL. Heart rate increased above preflight level during 7 percent of the overflights but returned to normal within 120 seconds. No behavioral response by the bighorn sheep was observed during the overflights.

Wild ungulates typically have little to no response to sonic booms. Workman *et al.* (1992) studied the physiological and behavioral responses of pronghorn (*Antilocapra americana*), elk (*Cervus elaphus*), and bighorn sheep to sonic booms. All three species exhibited an increase in heart rate lasting from 30 seconds to 1 ½ minutes in response to their first exposure to a sonic boom. After successive sonic booms, this response decreased greatly, indicating habituation.

A recent study in Alaska documented only mild short-term reactions of caribou (*Rangifer tarandus*) to military overflights in the Yukon Military Operations Areas (MOAs) (Lawler *et al.* 2005). A large portion of the Fortymile Caribou Herd calves underneath the Yukon MOAs. The authors concluded that military overflights did not cause any calf deaths, nor did cow-calf pairs exhibit increased movement in response to the overflights. Because daily movements increase with calf age, the authors controlled for calf age in their analysis. Lawler *et al.* (2005) generally only observed higher-level reactions, such as rising quickly from a bedded position or extended running, when the faster F-15 and F-16s were within 1,000 feet above ground level (AGL). They also noted considerable variation in responses due to speed, slant distance, group size and activity, and even individual variation with groups.

In contrast, a study of the Delta Caribou Herd in interior Alaska found that female caribou with calves exposed to low-altitude overflights moved about 2.5 kilometers more per day than those not exposed (Maier *et al.* 1998). The authors, however, stated that this distance was of low energetic cost. Furthermore, this study did not consider calf age in their analyses (Lawler *et al.* 2005), which may bias results. Harrington and Veitch (1991) expressed concern for survival and health of woodland caribou calves in Labrador, where military training flights are allowed within 100 feet AGL.

Few studies of the effects of low-altitude overflights have been conducted on moose (*Alces alces*) or Dall's sheep (*Ovis dalli*). Andersen *et al.* (1996) observed that moose responded more adversely to human stimuli than mechanical stimuli. Beckstead (2004) reported on a study of the effects of military jet overflights on Dall's sheep under the Yukon 1 and 2 MOAs in Alaska. He could find no difference in population trends, productivity, survival rates, behavior, or habitat use between areas mitigated and not mitigated for low-level military aircraft by the Alaska MOAs Environmental Impact Statement (EIS) (United States Air Force [Air Force] 1995). In the mitigated area, flights are restricted to above 5,000 feet AGL during the lambing season, while the unmitigated area could experience flights as low as 100 feet AGL. Similarly, large-force Major Flying Exercises did not adversely affect Dall's sheep.

Marine Mammals

The effects of noise on marine mammals, such as dolphins and whales, have been relatively well studied. Noise behaves differently underwater than in air, so a brief description of noise characteristics in the ocean environment is necessary.

Water is denser than air; therefore, sound waves travel five times faster in water (about 5,000 feet per second) than air (Stocker 2002). This density also allows sound to travel farther underwater. In addition, there are few obstacles (such as trees, houses, etc.) underwater that block sound. Since sound waves are influenced by density, factors that influence the density of

water also affect the travel of sound. Temperature, pressure, and salinity can result in varied water densities. The following discussion is from Air Force (2001).

Propagation of sound from air to water is a complicated topic. For a pressure wave arriving at the air/water interface at angles steeper than 13 degrees, the wave is transmitted into the water and propagates at a shallower angle in the water. The pressure in the water at the interface is double the incident pressure, and falls off according to propagation conditions in the water column.

For energy incident from air on the sea surface at angles less than 13 degrees, there is no transmission of energy as a propagating wave into the water. Instead, there is only an evanescent, or non-propagating, wave whose amplitude decays exponentially with depth in the water. As before, there is a doubling of pressure at the interface, but the impact is limited to a region close to the surface and point of incidence. The wave does not propagate on its own in water, but is "bound" to the pressure field in the air. It thus appears to travel horizontally at the velocity of the aircraft.

Because the plane is moving, subsonic noise from an aircraft can have angles both more and less than the critical 13 degrees. The pressure doubles at the surface, propagates for steep arrivals, and decays with depth for the less steep arrivals. For certain ocean conditions, the propagating energy may travel significant distance with low loss intensity. For this reason, a loitering airplane or helicopter may be more worrisome than a fast-moving or supersonic aircraft.

As for military fixed-wing aircraft traveling at subsonic speeds, noise source levels are generally less than 210 decibels (dB) (re 1 μPa at 1 m). For flights at an altitude of 1,000 feet, the maximum sound pressure level at the sea surface would be no greater than about 155 dB (re 1 μPa), which is well below most harassment thresholds in current use (Air Force 2001).

Because marine mammals rely on sound for communication, navigation, and capturing prey, the effect of noise on marine mammals is of particular concern. Anthropogenic noise in the ocean occurs from a variety of sources, ranging from small boats to icebreakers, to oil drilling and seismic exploration. Most of these noise sources are of greater concern than aircraft, for the reasons discussed above. For example, underwater noise from icebreakers (192 to 205 dB are 1 μPa at 1 m) have the potential to result in temporary hearing damage to beluga whales (*Delphinapterus leucas*) staying within 1 to 4 km of an icebreaker for 20 minutes (Erbe and Farmer 2000). In general, reported behavioral responses of marine mammals to aircraft noise range from no reaction to diving (Air Force 2001, Moore and Clarke 2002).

Perry *et al.* (2002) studied the above-water response of gray seals (*Halichoerus grypus*) and harbor seals (*Phoca vitulina*) to sonic booms. They observed no behavioral responses of gray seals to sonic booms, but harbor seals appeared more vigilant. Similarly, gray seals fitted with heart rate monitors showed no change in heart rate during or after a sonic boom while harbor seals showed a slight increase. Perry *et al.* (2002) concluded that sonic booms did not affect breeding behavior of the seals.

Small Mammals

A few researchers have studied the potential affects of aircraft noise on small mammals. Chesser *et al.* (1975) found that house mice (*Mus musculus*) trapped near an airport runway had larger adrenal glands than those trapped 2 kilometers from the airport. In the lab, naïve mice subjected to simulated aircraft noise also developed larger adrenal glands than a control group.

However, the implications of enlarged adrenals for small mammals with a relatively short life span are undetermined. The burrows of some small mammals may reduce their exposure to aircraft noise. Francine *et al.* (1995) found that kit foxes (*Vulpes macrotis*) with twisting tunnels leading to deeper burrows experienced less noise than kangaroo rats (*Dipodomys merriami*) with shallow burrows. McClenaghan and Bowles (1995) studied the effects of aircraft overflights on small mammals and were unable to distinguish potential long-term effects due to aircraft noise compared to other environmental factors.

Raptors

Most studies have found few negative effects of aircraft noise on raptors. Ellis *et al.* (1991) examined behavioral and reproductive responses of several raptor species to low-level flights. No incidents of reproductive failure were observed and site re-occupancy rates were high (95 percent) the following year. Several researchers found that ground-based activities, such as operating chainsaws or an intruding human, were more disturbing than aircraft (White and Thurow 1985, Grubb and King 1991, Delaney *et al.* 1997). Red-tailed hawks (*Buteo jamaicensis*) and osprey (*Pandion haliaetus*) appeared to readily habituate to regular aircraft overflights (Andersen *et al.* 1989, Trimper *et al.* 1998). Mexican spotted owls (*Strix occidentalis lucida*) did not flush from a nest or perch unless a helicopter was as close as 330 feet (Delaney *et al.* 1997). Nest attendance, time-activity budgets, and provisioning rates of nesting peregrine falcons (*Falco peregrinus*) in Alaska were found not to be significantly affected by jet aircraft overflights (Palmer *et al.* 2003). On the other hand, Andersen *et al.* (1990) observed a shift in home ranges of four raptor species away from new military helicopter activity, which supports other reports that wild species are more sensitive to rotary wing aircraft than fixed-wing aircraft.

The effects of aircraft noise on the bald eagle (*Haliaetus leucocephalus*) have been studied relatively well, compared to most wildlife species. Overall, there have been no reports of reduced reproductive success or physiological risks to bald eagles exposed to aircraft overflights or other types of military noise (Fraser *et al.* 1985, Stalmaster and Kaiser 1997, Brown *et al.* 1999; see review in Buehler 2000). Most researchers have documented that pedestrians and helicopters were more disturbing to bald eagles than fixed-wing aircraft, including military jets (Fraser *et al.* 1985, Grubb and King 1991, Grubb and Bowerman 1997). However, bald eagles can be disturbed by fixed-wing aircraft. Recorded reactions to disturbance ranged from an alert posture to flushing from a nest or perch. Grubb and King (1991) reported that 19 percent of breeding eagles were disturbed when an aircraft was within 625 meters (2,050 feet).

Waterfowl and Other Waterbirds

In their review, Manci *et al.* (1988) noted that aircraft can be particularly disturbing to waterfowl. Conomy *et al.* (1998) suggested, though, that responses were species-specific. They found that black ducks (*Anas rubripes*) were able to habituate to aircraft noise, while wood ducks (*Aix sponsa*) did not. Black ducks exhibited a significant decrease in startle response to actual and simulated jet aircraft noise over a 17-day period, but wood duck response did not decrease uniformly following initial exposure. Some bird species appear to be more sensitive to aircraft noise at different times of the year. Snow geese (*Chen caerulescens*) were more easily disturbed by aircraft prior to fall migration than at the beginning of the nesting season (Belanger and Bedard 1989). On an autumn staging ground in Alaska (i.e., prior to fall migration), 75 percent of brant (*Branta bernicla*) and only 9 percent of Canada geese (*Branta canadensis*) flew in response to aircraft overflights (Ward *et al.* 1999). There tended to be a greater response to aircraft at 1,000 to 2,500 feet AGL than at lower or higher altitudes. In

contrast, Kushlan (1979) did not observe any negative effects to wading bird colonies (i.e., rookeries) when fixed-wing aircraft conducted surveys within 200 feet AGL; 90 percent of the observations indicated no reactions from the birds. Nesting California least terns (*Sterna albifrons browni*) did not respond negatively to a nearby missile launch (Henningson, Durham, and Richardson 1981).

Previous research also shows varied responses of waterbirds to sonic booms. Burger (1981) found that herring gulls (*Larus argentatus*) responded intensively to sonic booms and many eggs were broken as adults flushed from nests. One study discussed by Manci *et al.* (1988) described the reproductive failure of a colony of sooty terns (*Sterna fuscata*) on the Dry Tortugas reportedly due to sonic booms. However, based on laboratory and numerical models, Ting *et al.* (2002) concluded that sonic boom overpressures from military operations of existing aircraft are unlikely to damage avian eggs.

Domestic Animals

As with wildlife, the startle reflex is the most commonly documented effect on domestic animals. Results of the startle reflex are typically minor (e.g., increase in heart rate or nervousness) and do not result in injury. Espmark *et al.* (1974) did not observe any adverse effects due to minor behavioral reactions to low-altitude flights with noise levels of 95 to 101 A-weighted decibels (dBA). They noted only minimal reactions of cattle and sheep to sonic booms, such as muscle and tail twitching and walking or running short distances (up to 65 feet). More severe reactions may occur when animals are crowded in small enclosures, where loud, sudden noise may cause a widespread panic reaction (Air Force 1993). Such negative impacts were typically only observed when aircraft were less than 330 feet AGL (United States Forest Service 1992). Several studies have found little direct evidence of decreased milk production, weight loss, or lower reproductive success in response to aircraft noise or sonic booms. For example, Head *et al.* (1993) did not find any reductions in milk yields with aircraft Sound Exposure Levels (SEL) levels of 105 to 112 dBA. Many studies documented that domestic animals habituate to aircraft noise (see reviews in Manci *et al.* 1998; Head *et al.* 1993).

There is little direct evidence that aircraft noise or sonic booms can cause domestic chicken eggs to crack or result in lower hatching rates. Stadelman (1958) did not observe a decrease in hatchability when domestic chicken eggs were exposed to loud noises measured at 96 dB inside incubators and 120 dB outside. Bowles and Seddon (1994) found no difference in the hatch rate of four groups of chicken eggs exposed to 1) no sonic booms (control group), 2) sonic booms of 3 pounds per square foot (psf), 3) sonic booms of 20 psf, and 4) sonic booms of 30 psf. No eggs were cracked by the sonic booms and all chicks hatched were normal.

3.0 Training Chaff and Flares

Specific issues and potential impacts of training chaff and flares on biological resources are discussed below. These issues have been identified by Department of Defense (DoD) research (Air Force 1997, Cook 2001), General Accounting Office review (United States General Accounting Office 1998), independent review (Spargo 1999), resource agency instruction, and public concern and perception. No reports to date have documented negative impacts of training chaff and flares to biological resources. These studies are reviewed below.

Concerns for biological resources are related to the residual materials of training chaff and flares that fall to the ground or dud flares. Residual materials are several flare components, including plastic end caps, felt spacers, aluminum-coated wrapping material, plastic retaining devices,

and plastic pistons. Specific issues are (1) ingestion of chaff fibers or flare residual materials; (2) inhalation of chaff fibers; (3) physical external effects from chaff fibers, such as skin irritation; (4) effects on water quality and forage quality; (5) increased fire potential; and (6) potential for being struck by large flare debris (the plastic Safe and Initiation [S&I] device of the MJU-7 A/B flare).

Because of the low rate of application and dispersal of training chaff fibers and flare residues during defensive training, wildlife and domestic animals would have little opportunity to ingest, inhale, or otherwise come in contact with these residual materials. Although some chemical components of chaff are toxic at high levels, such levels could only be reached through the ingestion of many chaff bundles or billions of chaff fibers. Barrett and MacKay (1972) documented that cattle avoided consuming clumps of chaff in their feed. When calves were fed chaff thoroughly mixed with molasses in their feed, no adverse physiological effects were observed pre- or post-mortem.

Chaff fibers are too large for inhalation, although chaff particles can degrade to small pieces. However, the number of degraded or fragmented particles is insufficient to result in disease (Spargo 1999). Chaff is similar in form and softness to very fine human hair, and is unlikely to cause negative reactions if animals were to inadvertently come in contact with it.

Chaff fibers could accumulate on the ground or in water bodies. Studies have shown that chaff breaks down quickly in humid environments and acidic soil conditions (Air Force 1997). In water, only under very high or low pH could the aluminum in chaff become soluble and toxic (Air Force 1997). Few organisms would be present in water bodies with such extreme pH levels. Given the small amount of diffuse or aggregate chaff material that could possibly reach water bodies, water chemistry would not be expected to be affected. Similarly, the magnesium in flares can be toxic at extremely high levels, a situation that could occur only under repeated and concentrated use in localized areas. Flare ash would disperse over wide areas; thus, no impact is expected from the magnesium in flare ash. The probability of an intact dud flare leaving an aircraft during training and falling to the ground outside of a military base is estimated to be 0.01 percent (Air Force 2001). Since toxic levels would require several dud flares to fall in one confined water body, no effect of flares on water quality would be expected. Furthermore, uptake by plants would not be expected to occur.

The expected frequency of an S&I device from an MJU-7 A/B flare striking an exposed animal depends on the number of flares used and the size and population density of the exposed animals. Calculations of potential strikes to a human-sized animal with a density of 50 animals per square mile, where 8,000 flares were used annually, was one strike in 200 years. An animal $1/100^{th}$ the size of a human with a density of 500 animals per square mile exposed 100 percent of the time (i.e., animals not protected by burrows or dense vegetation) would also have an expected strike rate of one in 200 years. The S&I device strikes with the force of a medium-sized hailstone. Such a strike to a bird, small mammal, or reptile could produce a mortality. The very small likelihood of such a strike, especially when compared with more immediate threats such as highways, would not be expected to have any effect on populations of small species. Strikes to larger species, such as wild ungulates or farm animals could produce a bruise and a startle reaction. Such a strike from an S&I device would not be expected to seriously injure or otherwise significantly affect natural or domestic species.

Flare debris also includes aluminum-coated mylar wrapping and lighter plastic parts. The plastic parts, such as end caps, are inert and are not expected to be used by or consumed by any

species. The aluminum coated wrapping, as it degrades, could produce fibrous materials similar to naturally occurring nesting materials. There is no known case of such materials being used in nest construction. In a study of pack rats (*Neotoma* spp.), a notorious collector of odd materials, no chaff or flare materials were found in nests on military ranges subject to decades of dispensing chaff and flares (Air Force 1997). Although lighter flare debris could be used by species under the airspace, such use would be expected to be infrequent and incidental.

Bovine hardware disease is of concern for domestic cattle. Hardware disease, or traumatic reticuloperitonitis, is a relatively common disease in cattle. The disease results when a cow ingests a foreign object, typically metallic. The object can become lodged in the wall of the stomach and can penetrate into the diaphragm and heart, resulting in pain and infection; in severe cases animals can die without treatment. Treatment consists of antibiotics and/or surgery. Statistics are not readily available, but one study documented that 55-75 percent of cattle slaughtered in the eastern United States (U.S.) had metallic objects in their stomachs, but the objects did not result in damage (Moseley 2003). Dairy cattle are typically more vulnerable to hardware disease due to the confined nature of diary operations. Many livestock managers rely on magnets inserted into the cow's stomach to prevent and treat hardware disease. The magnet attracts metallic objects, thereby preventing them from traveling to the stomach wall.

The culprit of bovine hardware disease is often a nail or piece of wire greater than 1 inch in length, such as that used to bale hay (Cavedo et al. 2004). If livestock ingested residual materials of the M-206 and MJU-7 A/B flares, the plastic materials of the end cap and slider and the flexible aluminum wrapping would be less likely to result in injury than a metallic object.

Flares used for training by F-15 and F-22 aircraft are designed to burn out within approximately 400 feet of the release altitude. Given the minimum allowable release altitudes for flares, this leaves an extensive safety margin to prevent any burning materials from reaching the ground (Air Force 2001). In the Alaska training airspace, flares must be released above 5,000 feet AGL from June 1 to September 30 to reduce any potential of a flare-caused fire. For the remainder of the year when soils and vegetation are moist or snow covered, flares can be released above 2,000 feet AGL. Plastic and aluminum coated wrapping materials from flares that do reach the ground would be inert. The percentage of flares that malfunction is small (<1 percent probability for all categories of malfunction; Air Force 2001). Dud flares (i.e., those that do not ignite at release and fall intact to the ground) contain magnesium, which is thermally stable and requires a temperature of 1,200 degrees Fahrenheit for ignition. Self-ignition is highly unlikely under natural conditions.

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Appendix F
Summary of Elmendorf AFB Historic Setting

APPENDIX F SUMMARY OF ELMENDORF AFB HISTORIC SETTING

Elmendorf AFB Historical Setting

Paleo Arctic Period (10,000 – 6,000 BP)

During the Pleistocene, massive continental ice sheets consumed a portion of the world's water supply lowering sea levels as much as 400 feet and exposing a land bridge between northeastern Asia and Alaska known as Beringia (Fagan). At the same time, northern and central Alaska experienced less glaciation than much of North America (National Park Service [NPS] 2005a). Alaska's interior, as well as Beringia, was a relatively ice-free region with steppe tundra vegetation that supported mammoth, musk ox, giant beaver, mastodon, and sloth. It is by way of Beringia and through the ice-free region that North America was likely first populated. There is also good evidence to suggest that populations also moved into North America along a coastal route. The first inhabitants of the region were technologically similar to contemporary northeast Asian populations and are commonly referred to as the Paleoarctic or Siberian-American Paleoarctic Tradition. They used a stone tool technology based on small blades, small blade cores, and composite tools, and were widespread through Alaska from 6000 to 10,000 before present (BP). While fluted projectile points credited to Paleoindian populations (Clovis, Folsom) have been found in Alaska, they have not been dated firmly enough to mark the migration or diffusion of the technology into the region (NPS 2005a).

Archaic Period (6000 - 1800 BP)

The Northern Archaic Tradition seems to be related to the Archaic cultures of the boreal forest south and east of Alaska. This group or groups appeared around 6000 BP across a wide area of Alaska (NPS 2005a). Some of the sites include microblade technology and tabular microcores. The presence or absence of this earlier technology has led to varying interpretations of the origins and roles of the Northern Archaic people. It has been identified both as an interior tradition resulting from people following the expanding boreal forest northward during a climatic warming period and displacing local descendants of Paleoarctic groups, and as a technological diffusion that spread from the boreal forests northward and westward.

Late Prehistoric/Protohistoric Period (ca. 1800 to 150 BP)

During this time, the indigenous inhabitants of Alaska specialized toward subsistence patterns suitable to the various available environments. In interior Alaska, inhabitants have been characterized as primarily caribou hunters, oriented toward upland, treeless areas (NPS 2005a).

Southwestern Alaska is an area of Pacific Eskimo co-traditions stretching from the Alaska Peninsula west of Kodiak Island to the Copper River delta on the Gulf of Alaska. In late prehistoric times, the population of this region fell into two major linguistic divisions: Aleutian and Eskimoan. The dividing line between the two groups was the Alaska Peninsula. Both groups shared traits based on their common subsistence strategies as marine hunters and their common roots as Eskaleut peoples.

At the time of European contact, the coast of Alaska north of the Alaska Peninsula was occupied by people adapted to life along winter ice-bound coasts. They spoke two distinct Eskimoan languages. The Aleuts, whose language was related to Eskimoan, inhabited the region from the

tip of the Alaska Peninsula, westward throughout the Aleutian Islands. They practiced open-water hunting and fishing. The Alaskan interior was home to broadly adapted hunters and fishers of the boreal forest. Several distinct languages were spoken by these people, all part of the Athabaskan family of languages (NPS 2005a).

Russian AND American Periods (A.D. 1700 to 1940)

In 1741, Danish explorer Vitus Bering's Russian expedition visited Alaska, initiating the wholesale harvest of sea otter pelts. The Russian American Company was granted sole trading rights in America in 1799, and the fur harvest increased in the early 1800s under the leadership of Alexander Baranov. Russian settlements were established at Sitka (New Archangel), the Russian capitol in America, and at other locations throughout the region in the early 1800s. Gold was discovered by Russian prospectors on the Kenai Peninsula in 1849.

Following attacks on Russian settlements by native groups, rising costs of administering the territory, and the collapse of the fur trade, Russia sold Alaska to the U.S. in 1867 for $7.2 million. Alaska was largely ignored by the U.S. until the mid-1890s when gold was discovered on Birch Creek and in the Yukon Territory of Canada (NPS 2005b). By the 1890s, and with the rush to the Klondike Gold fields, gold exploration took place throughout the country. Strikes were made along the Yukon River, and in 1902 a major strike in the interior resulted in the settlement of Fairbanks (NPS 2005a).

In 1912, Alaska became a U.S. territory. Two years later, construction began on the Alaska Railroad, planned to extend from Seward to Fairbanks. Anchorage was established as a construction camp on the railroad line and thousands of workers poured into the area in 1915. Although the town voted to call itself Alaska City, the federal government refused to change the name from Anchorage (Alaska Department of Community and Economic Development [DCED] 2000).

Military Period (1940 to Present)

Referred to as "the most strategic place in the world" by Billy Mitchell in 1935, Alaska received a military presence with the construction of Elmendorf Field in June of 1940 (Elmendorf AFB 2006). Although the air facilities retained the name Elmendorf Field, the rest of the installation was redesignated Fort Richardson by the War Department later that same year. The first Air Force unit, the 18th Pursuit Squadron, arrived in 1941, with the 23rd Air Base Group assigned for base support shortly thereafter. Other units arrived as the Japanese threat developed into World War II. The 11th Air Force formed at Elmendorf Field in 1942 (Elmendorf AFB 2006). The field served as the main air logistics center and staging area during the Aleutian Campaign and subsequent air operations in the Kurile Islands of Japan (Air Force 2003b). In 1945, the 11th Air Force was designated the Alaskan Air Command (AAC).

The P-38 supported shipping and island defense during WWII. This P-38 was restored by base personnel.

After World War II, the Army moved its operations to a new Fort Richardson site, while the Air Force assumed control of the original Fort Richardson and renamed it Elmendorf AFB in 1948 (Air Force 2003b). Post-war uncertainties led to a build-up of air defense forces in Alaska with the Alaskan NORAD Regional Operations Control Center at Elmendorf serving as the center for air defense operations in Alaska (Air Force 2003b). The next two decades saw a switch from prop-driven fighter (F-51) to a series of jet fighter aircraft (F-

80, F-94, F-89, F-102), all of which were utilized as interceptor aircraft for the defense of North America (Elmendorf AFB 2006). Such efforts required the development of new communication systems to coordinate the activities of isolated posts throughout the state.

With six fighter interceptor squadrons, the AAC reached its apex of operations in 1957 with nearly 200 fighter aircraft located at Elmendorf AFB and Ladd AFB. Controlled by an elaborate system of 18 aircraft control and radar warning sites, Elmendorf became known as the "Top Cover for North America," a motto that was officially adopted by the AAC in 1969 (Elmendorf AFB 2006).

Elmendorf experienced a steady decline through the late 1950s, 1960s, and early 1970s. Ladd AFB, also part of the AAC, was consigned to the Army in 1961 and renamed Fort Wainwright (Elmendorf AFB 2006). The base received a boost in 1970 when the 43rd Tactical Fighter Squadron relocated to Elmendorf. Along with the activation of the 18th Tactical Fighter Squadron, the AAC now had an air-to-ground capability utilizing the F-4E. In 1975, the AAC was dissolved. Elmendorf began supporting other commands, with an emphasis on military airlift operations (Elmendorf AFB 2006).

In the 1980s, Elmendorf AFB experienced a period of growth and modernization, including the construction of an enhanced Regional Operations Control Center. In the early 1980s, the 18th and 21st Tactical Fighter Squadrons switched aircraft to A-10s and F-15s, respectively. Additionally, the 54th Tactical Fighter Wing was reactivated at Elmendorf in 1987 (Elmendorf AFB 2006). Alaska's air defense was further augmented with the addition of two E-3As in 1986, and the AAC was reestablished in 1989 under the Air Force's Pacific Command. With the closure of Clark AFB (due to the expiration of the Philippine lease and the eruption of Mt. Pinatubo), the F-15E Strike Eagle equipped the 90th Tactical Fighter Wing. In addition, the 3rd Wing, and the Pacific Regional Medical Center were moved to Elmendorf in 1991 (Global Security 2006). These changes precipitated the deactivation of the 21st Wing, in keeping with Air Force policy to retain older units during times of force reductions (Elmendorf AFB 2006). Elmendorf continues at a strategic location at the "Top Cover of North America."

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ACRONYMS AND ABBREVIATIONS

3 CES	3rd Civil Engineering Squadron
3 WG	3rd Wing
AAC	Alaskan Air Command
AATA	Anchorage Alaska Terminal Area
AEF	Aerospace Expeditionary Forces
AFB	Air Force Base
AFI	Air Force Instruction
AGE	Aerospace Ground Equipment
AGL	above ground level
Air Force	United States Air Force
AMU	Aircraft Maintenance Unit
APZ	Accident Potential Zone
AQCR	Air Quality Control Region
ARTCC	Air Route Traffic Control Center
ATC	Air Traffic Control
ATCAA	Air Traffic Control Assigned Airspace
BAA	Backup Aircraft Authorization
BAI	Backup Aircraft Inventory
BASH	Bird-Aircraft Strike Hazard
BLM	Bureau of Land Management
BMP	Best Management Practice
BP	Before Present
BRAC	Base Realignment and Closure
CAA	Clean Air Act
CDNL	C-weighted Day-Night Average Sound Level
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CO	carbon monoxide
CZ	Clear Zone
dB	decibel
DCED	Department of Community and Economic Development
DoD	Department of Defense
EA	Environmental Assessment
EAF	Expeditionary Air Force
EIS	Environmental Impact Statement
EO	Executive Order
EOD	explosive ordnance disposal
ERP	Environmental Restoration Program
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FDE	Force Development and Evaluation
FTE	Fighter Town East
FY	Fiscal Year
GBU	Guided Bomb Unit
HAP	High Accident Potential
HAZMART	Hazardous Materials Pharmacy
Hz	hertz (cycles per second)
IFR	Instrument Flight Rule
IICEP	Interagency and Intergovernmental Coordination for Environmental Planning
IOT&E	Initial Operational Test and Evaluation
IR	Instrument Route
JDAM	Joint Direct Attack Munition
KIAS	Knots Indicated Airspeed
L_{dn}	Day-Night Average Sound Level
L_{dnmr}	Onset-Rate Adjusted Monthly Day-Night Average Sound Level
L_{max}	maximum sound level
LRSOW	Long Range Stand-Off Weapons
MILCON	Military Construction
MOA	Military Operations Area
MSL	mean sea level
MTR	Military Training Route
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NM	nautical mile
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRHP	National Register of Historic Places
NRIS	National Register Information Service
O_3	ozone
P.L.	Public Law
P/CG	Pilot/Controller Glossary
PAA	Primary Aircraft Authorization
PACAF	Pacific Air Forces
PAI	Primary Aircraft Inventory
Pb	lead
PM_{10}	particulate matter less than or equal to 10 micrometers in diameter
$PM_{2.5}$	particulate matter less than or equal to 2.5 micrometers in diameter
ppm	parts per million
PSD	Prevention of Significant Deterioration
psf	pounds per square foot
ROI	Region of Influence
S&I	Safe and Initiation
SDB	Small Diameter Bomb
SEL	Sound Exposure Level
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SO_2	sulfur dioxide
SO_x	sulfur oxides
SUA	Special Use Airspace
SWPPP	Storm Water Pollution Prevention Plan
TPY	tons per year
U.S.	United States
USACE	United States Army Corps of Engineers
USC	United States Code
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Agency
VFR	Visual Flight Rule
VOC	volatile organic compound
VR	Visual Route
$\mu g/m^3$	micrograms per cubic meter